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AQUATIC DISPOSAL FIELD INVESTIGATIONS GALVESTON, TEXAS, OFFSHOR--ETC(U)
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DREDGED MATERIAL RESEARCH PROGRAM

TECHNICAL REPORT D-77-20

AD A061844

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AQUATIC DISPOSAL FIELD INVESTIGATIONS GALVESTON, TEXAS, OFFSHORE DISPOSAL SITE

EVALUATIVE SUMMARY

LEVEL

by

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U. S. Army Engineer Waterways Experiment Station
P. O. Box 631, Vicksburg, Miss. 39180

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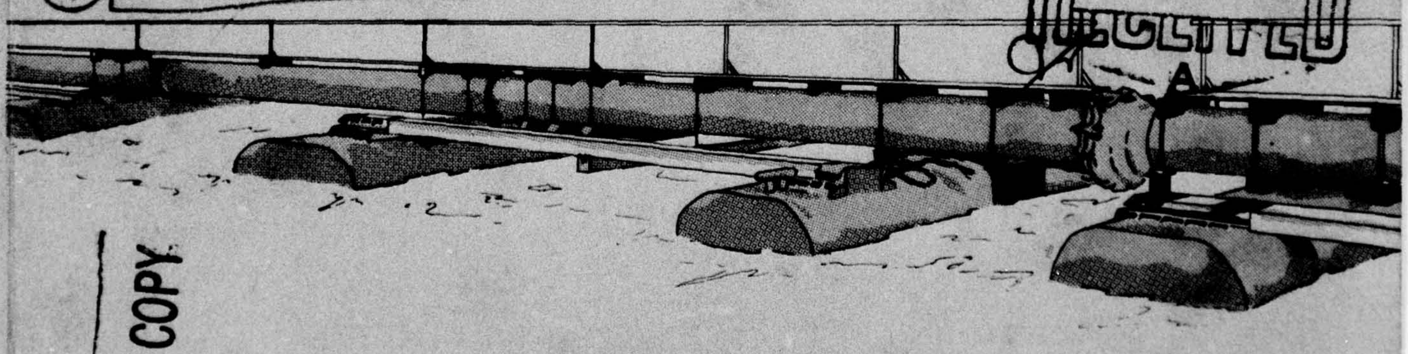

OFFSHORE DISPOSAL SITE, EVALUATIVE SUMMARY MAY 1978

Prepared for Office, Chief of Engineers, U. S. Army
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Under DMRP Work Unit No. 1A09

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AQUATIC DISPOSAL FIELD INVESTIGATIONS,
GALVESTON, TEXAS, OFFSHORE DISPOSAL SITE

Appendix A: Investigation of the Hydraulic Regime and Physical Nature of Sedimentation

Appendix B: Investigation of Water-Quality Parameters and Physicochemical Parameters

Appendix C: Investigation of the Effects of Dredging and Dredged Material Disposal on Offshore Biota

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Biota	Environmental effects
Disposal areas	Field investigations
Dredged material	Galveston Offshore Dredged Material Disposal Site
Dredged material disposal	Sediment

20. ABSTRACT (Continue on reverse side if necessary and identify by block number)

This study was part of an investigation to determine the environmental effects of offshore dredged material disposal at Galveston, Texas. The biological portion of the study was conducted in two phases: a pilot survey of the dredged material disposal site (DMDS) to determine the areal distribution of the biota and sediments; and an experimental study to assess the effect of dredged material disposal on the biota at selected sites in the DMDS. Three experimental sites were investigated: a sandy bottom that received sand, shell, and silt-clay dredged material; a muddy bottom that received (Continued)

CONT

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20. ABSTRACT (Continued).

CONT

sand and shell dredged material; and a muddy bottom that received silt-clay dredged material.

Dredged material disposal did not appear to have an acute impact on the benthos at any disposal site; any effect was masked by natural population fluctuations following disposal. However, subsequent alterations in benthic populations may have occurred: Beaumont Clay appeared to have a depressive effect while sand-shell dredged material deposited on a muddy bottom appeared to have a stimulative effect. Benthic populations in the ship channel were reduced by dredging, but began to recover as soon as sediments began to accumulate in the channel bottom.

The magnitude of the effect on the benthic populations could not be accurately assessed because adequate predisposal data on natural sediment and benthic population changes were not available. Dredged material deposits had no apparent effect on feeding habits of fish or on the distribution of nekton, although some nektonic species may have congregated in the turbid water following dredged material disposal. Zooplankton and phytoplankton studies detected no population changes during disposal that could not have been due to sampling error.

It is probable that sudden abiotic changes and commercial fishing activities cause more destruction of biota than dredging-related activities.

DEPARTMENT OF THE ARMY
WATERWAYS EXPERIMENT STATION, CORPS OF ENGINEERS
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IN REPLY REFER TO: WESYV

15 July 1978

SUBJECT: Transmittal of Technical Report D-77-20

TO: All Report Recipients

1. The technical report transmitted herewith contains a summary of the results of several research efforts (work units) undertaken as part of Task 1A, Aquatic Disposal Field Investigations, of the Corps of Engineers' Dredged Material Research Program (DMRP). Task 1A was part of the Environmental Impacts and Criteria Development Project (EICDP), which had as a general objective the evaluation of the effects of open-water disposal on biota and on water quality at selected disposal areas. This report is a summary of the physical, chemical, and biological studies that were conducted at the Galveston, Texas, disposal site. This research site was one of five studied under the DMRP in various geographical regions of the United States.

2. This report, Aquatic Disposal Field Investigations, Galveston, Texas, Offshore Disposal Site; Evaluative Summary, presents an overview of three research efforts conducted at the Galveston site. Three contractor-prepared reports (Appendices A-C) describe these research efforts. The titles of the appendices are listed on the inside front cover of this report. Appendix C was reproduced on microfiche and is inclosed in an envelope inside the back cover. This report provides additional results, interpretations, and conclusions not found in the appendices and, in addition, provides a comprehensive summary and synthesis of the entire study.

3. The purpose of the Galveston study was to determine the physical, chemical, and biological effects of open-water disposal of dredged material in the Gulf of Mexico adjacent to the entrance to Galveston Bay. This study involved the detailed monitoring of disposal of small amounts of highly contaminated material dredged from the Texas City Turning Basin as well as clean sand and sandy silt from the Galveston Bay Channel.

4. Disposal events and the short-term impacts of the disposal of dredged material and the subsequent recolonization of the affected sites were evaluated at three dump sites within the main site. The material deposited in the shallow parts of the disposal site experienced a rather

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rapid rate of erosion and dispersal while the material in the deeper parts tended to remain in place. The chemical impact of disposal on water-quality and sedimentological parameters was minimal. Biological impacts also appeared to be of marginal significance. Changes in the abundance and types of organisms in the disposal areas could not be distinguished from changes in reference areas.

5. Conclusions based on the data presented indicate that while effects of disposal were indicated in the benthic communities and in the sediments, these effects generally were transient in nature. In addition, there was no indication of accelerated uptake of contaminants by organisms as a direct result of disposal.

6. Results of this research will be useful on a regional basis for evaluating the possible environmental impacts of open-water disposal in shallow Gulf of Mexico environments. This information will be helpful in planning future dredging and disposal projects involving open-water disposal so as to minimize adverse environmental effects.

John L. Cannon

JOHN L. CANNON
Colonel, Corps of Engineers
Commander and Director

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19. KEY WORDS (Continue on reverse side if necessary and identify by block number)

Aquatic environment	Galveston Offshore Dredged Material Disposal Site
Dredged material	Pollutants
Dredged material disposal	Sediment
Environmental effects	Waste disposal sites
Field investigations	Water quality

20. ABSTRACT (Continue on reverse side if necessary and identify by block number)

An investigation of the physical (sedimentological), chemical, and biological impacts of dredged material disposal was conducted in 1975 and 1976 at an authorized disposal site offshore from Galveston, Tex. A hopper dredge was used for dredging and disposal, and most of the dredged material consisted of clean sand and sandy silt from the Galveston Bay Channel. A small amount of contaminated material from the Texas City Turning Basin was also placed in the disposal site.

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20. ABSTRACT (Continued)

Three areas within the site were employed for disposal. Two reference areas, also within the site, were chosen to provide a basis for distinguishing natural changes from those which might result from disposal. The disposal and reference areas were selected on the basis of information obtained from a predisposal pilot study.

The physical (sedimentological) effort consisted of the installation of equipment to determine current direction and magnitude, overflights to assess turbidity, sediment grain-size analyses, bathymetric surveys for the rate of disposal mound erosion, and sediment tracers (labelled sediment) to describe the direction of sediment transport.

The chemical studies were oriented toward the determination of changes in the water column during dredged material disposal and in the sediments after disposal. Although a number of variables were evaluated, primary emphasis was placed upon heavy metals, nutrients, and changes in dissolved oxygen.

The primary thrust of the biological investigations centered upon the impact that disposal of dredged material might have upon communities of bottom-dwelling organisms (benthic macroinvertebrates). Samples were taken to determine the numbers and kinds of organisms present in disposal and reference areas before and after disposal.

The results indicated that the authorized disposal site was appropriate for the disposal of material from the areas that were dredged. Sediment movement after disposal was away from the dredged areas; disposition would not occur in navigation channels. As expected, material deposited in the shallow parts of the disposal site had a rather rapid rate of erosion and dispersal, while that placed in the deeper areas tended to remain in place throughout the study period.

The chemical impact of disposal on water quality and sedimentological parameters was minimal. Although some changes were observed, these could best be described as having little, if any, significance and were difficult to separate from natural variation in the reference areas.

Biological impacts also appeared to be of marginal significance. Changes in the abundance and types of organisms in disposal areas could not be distinguished from changes in reference areas. There appeared to be very large seasonal (natural) changes in organism abundance, and these changes coincided with the disposal of dredged material.

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SUMMARY

To investigate the environmental impact of open-water disposal, five field sites were chosen for Aquatic Disposal Field Investigations (ADFI). One of these was located offshore from Galveston, Tex. Field work at Galveston was initiated in the spring of 1975 and continued until early summer of 1976. The first phase consisted of a pilot study for the selection of suitable disposal and reference areas within the authorized disposal site. This was followed by the collection of predisposal physical, chemical, and biological data from disposal and reference areas during the summer of 1975. The majority of disposal took place in the fall of 1975, and the remainder of the investigation concerned postdisposal changes in physical variables, chemistry, and the biota.

The experimental design of the Galveston ADFI was such that a number of questions concerning disposal were to be answered. The major ones are given below:

Physical characteristics:

- *a*. What is the current regime and how can currents affect the redistribution of disposed material?
- *b*. Does disposed material remain in situ and, if so, for how long?
- *c*. Does disposal result in short- and/or long-term changes in the sediment in the disposal area?

Chemical characteristics:

- *a*. Does disposal cause short- and/or long-term changes in the quality of water and sediment?
- *b*. If there are water quality changes, are these of such a magnitude or do they involve substances that will affect organisms in the sediment or in the water column?

Biological characteristics:

- *a*. Are there changes in the number, kind, and biomass of bottom-dwelling organisms as a result of disposal, and, if so, what is the time frame and pattern of recovery?
- *b*. Are the organisms which inhabit the water column affected during disposal or by the release of substances from dredged material after disposal?

It was anticipated that sampling would be done in such a manner as to allow the relation of physical and chemical effects with each other and to also relate them, perhaps in a cause-and-effect manner, to biological effects. This was not possible because the various physical, chemical, and biological samples were generally taken at different times and places. This factor, in itself, made it difficult to detect and evaluate changes which may have taken place as a result of disposal.

In general, the Galveston ADFI reached a series of negative conclusions. That is, one cannot effectively demonstate the absolute lack of an effect; one may demonstate (with some degree of statistical confidence) that an effect of significance did occur. When an anticipated effect is not found, the causal factors may include inappropriate sampling techniques, high variability of results (commonly resulting from an inadequate sample size), or errors in data collection and analysis.

It was found that currents (and perhaps wave action) were adequate to erode material from the most shallow disposal area. There was some evidence of erosion at an intermediate depth, and there appeared to be little erosion in the deepest area. Quantitative estimates of erosion are suspect because of doubt as to the amount of material deposited, position location error, and the sporadic nature and inaccuracy of bathymetric surveys. Likewise, variability in sediment collection and analyses was such that conclusions regarding changes in sediment composition are highly tentative. It did appear that the movement of disposed material was away from the dredging area and the material would not likely be redeposited in the navigation channel.

With the exception of manganese and ammonium, none of the chemical variables examined exhibited an appreciable change in the water column. Some increases were observed in manganese and ammonium, but these were of such small temporal and spatial magnitudes as to be of little significance to organisms in the water column. There was a reduction in dissolved oxygen during several disposal operations, but this appeared to be quite transient and of low magnitude. There was

essentially no change in sediment chemistry as a result of disposal of dredged material.

Most of the biological data were of such a nature that no conclusions regarding the effects of dredged material disposal could be drawn. The most reliable body of information concerned the bottom-dwelling organisms (benthic macroninvertebrates). Detailed analyses of the response of these organisms to disposal indicated that there was little overall effect when sampling error and natural variability were taken into account. In the few instances where a change in abundance or species composition was observed, the overall ecological impact could not be estimated. This represents a clear deficiency in the current state of knowledge concerning many of these organisms because there is no way of knowing what ultimate impact that small changes in species composition or abundance may have upon the biotic community as a whole.

Again, it should be emphasized that the general lack of demonstrable effects does not imply that there were none. It merely indicates that, within the constraints and confines of the available data and the analyses which were applied to them, none were found.

An overall conclusion of the Galveston ADFI is that the authorized disposal site appears to be appropriate for the disposal of dredged material from the areas that were dredged. Physical, chemical, and biological impacts appeared to be quite minimal within the disposal site. Current philosophy is such that, by definition, effects and impacts of a fairly severe nature are expected and tolerated within an authorized disposal site. Since there appeared to be no such severe effects or impacts within the disposal site, it is unlikely that any occurred outside the site. Thus, there would seem to be little reason to modify current disposal techniques or to conduct additional investigations concerning impacts beyond the limits of the site.

PREFACE

This report presents a summary of the results of a comprehensive investigation of open-water disposal of dredged material offshore of Galveston, Tex. The investigation was conducted during the period March 1975-June 1976, as part of the Dredged Material Research Program (DMRP), Environmental Impacts and Criteria Development Project (EICDP), under Work Unit No. 1A09. The DMRP was sponsored by the Office, Chief of Engineers, U. S. Army, and was managed by the Environmental Laboratory (EL) of the U. S. Army Engineer Waterways Experiment Station (WES), Vicksburg, Miss.

This report was prepared by Dr. Thomas D. Wright, Mr. David B. Mathis, and Mr. James M. Brannon under the general supervision of Dr. John Harrison, Chief of EL, and Dr. Roger T. Saucier, Special Assistant for Dredged Material Research. Dr. Robert M. Engler was Project Manager. Site Managers were Mr. Mathis, Environmental Monitoring and Assessment Branch (EMAB) (January 1975-August 1976), and Dr. Wright, EMAB (September 1976-August 1977). Mr. Stephen P. Cobb, EMAB, was site coordinator. Dr. Peter J. Shuba, Ecosystem Research and Simulation Division, and Mr. Barry W. Holliday, EICDP, made significant contributions in analysis and interpretation of the physical and biological data.

COL D. S. McCoy, CE, of the Galveston District, was the Contracting Officer. Mr. Dolan Dunn, Galveston District, provided liaison with the District, coordinated various activities, and provided information concerning dredging schedules and other logistic and administrative matters.

Directors of WES during the investigation were COL G. H. Hilt, CE, and COL J. L. Cannon, CE. Mr. F. R. Brown was Technical Director.

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NOTE: Appendices A and B to this report were reproduced separately (see list of appendices on inside of front cover). Appendix C was reproduced on microfiche and is included in an envelope inside the back cover.

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AQUATIC DISPOSAL FIELD INVESTIGATIONS
GALVESTON, TEXAS, OFFSHORE DISPOSAL SITE
EVALUATIVE SUMMARY

PART I: INTRODUCTION

Background

1. The Dredged Material Research Program (DMRP) was initiated in 1973 as a four-phase, 5-year comprehensive program authorized under the River and Harbor Act of 1970 (PL 91-611, Section 123). The primary objective of the program is to investigate the environmental impact of dredging and dredged material disposal operations and to develop technically sound, environmentally compatible, and economically feasible dredging and disposal alternatives, including the use of dredged material as a manageable resource.[1]

2. An important component of the DMRP is Task 1A, the Aquatic Disposal Field Investigations (ADFI) of the effects of dredged material disposal on the biota and water quality within designated open-water disposal sites. This research task is part of the Environmental Impacts and Criteria Development Project which is being conducted at freshwater, estuarine, and marine sites, one of which is offshore from Galveston, Tex., in the Gulf of Mexico.

3. Site selection was by an interdisciplinary study team from the U. S. Army Engineer Waterways Experiment Station. The team surveyed 22 sites in the Gulf region which had received significant use as dredged material disposal sites.[2] Each of these sites was evaluated in terms of its suitability for study purposes. Criteria used for evaluation included availability of background information, ecological data, availability of logistic support for a comprehensive field investigation, and availability of characteristics (as defined by the regional survey) that represent the major types of open-water disposal activities within the Gulf region. The representative parameters included physical and chemical characteristics of dredged material disposed at the site, type(s) of substrate the material is disposed upon, annual volume of material

disposed, frequency of disposal, and water depth at the disposal site. Based on this evaluation and the scheduled maintenance dredging, the Galveston offshore disposal site was selected as an ADFI site.

4. Offshore disposal in the Gulf region annually accounts for about 15 percent (by volume) of all federally sponsored open-water dredged material disposal within the United States. Table 1 compares annual disposal of dredged material at Galveston with that for the Gulf region.

Table 1

Dredged Material Disposal
at Galveston, Tex., and in the Gulf Region

	Dredged Material Discharged, 10^6 m^3	
Year	Gulf Region	Galveston
1965	25.8	0.9
1966	22.9	1.8
1967	32.2	1.2
1968	32.5	2.2
1969	25.8	1.1
1970	31.5	1.8
1971	28.4	1.4
1972	NA	2.4
1973	NA	1.4
1974	NA	0.9
1975	NA	1.3

NOTE: NA denotes not available.

5. Much of the material dredged in the Gulf region consists of sandy sediments deposited in harbor entrances and channels by littoral processes, although some results from riverine sources. Designated offshore disposal sites in the Gulf are normally situated adjacent to their associated navigation channel and within the 15-m depth contour. Most of the dredged material is classified as "nonpolluted" and hence is deposited offshore.

Purpose and Objectives

6. The Galveston ADFI had three principal objectives:

   a. To evaluate the impact of disposal upon the aquatic biological community.

   b. To determine the chemical impact of disposal on the water column and sediment.

   c. To ascertain the movement and eventual fate of dredged material deposited at the offshore disposal site.

These broad objectives formed the basis for a variety of biological, chemical, and physical studies. The general research plan is described in Becker et al.[3] Specific objectives are described below.

Physical studies

7. Specific objectives of the physical studies were:

   a. To determine the bathymetric, sedimentological, and subbottom characteristics of the dredged material disposal site prior to the initiation of disposal activities.

   b. To determine the characteristics of the hydraulic regime including the critical erosion velocities necessary to suspend and transport sediments, current velocities and direction, and amounts of suspended matter in the water column.

   c. To determine the natural changes in sediment composition with time.

   d. To determine if the dredged material mounds were being eroded with time and, if so, where the material was being transported.

   e. To monitor disposal activities to determine the length of time required for the reestablishment of ambient conditions.

Chemical studies

8. Specific objectives of the chemical studies were:

   a. To determine the concentrations of nutrients, heavy metals, and other chemical parameters in sediments and perform water quality studies of appropriate parameters of the disposal site prior to disposal operations.

b. To determine the dissolved and particulate materials that are released into the water from dredged material and the temporal and spatial extent to which these released materials remain above ambient levels during and immediately after disposal.

c. To determine if the disposal of dredged material would alter the chemical composition of sediment in the disposal site and, if so, how long such alteration would persist.

Biological studies

9. Specific objectives of the biological studies were:

a. To determine the spatial and temporal distributions of the biological assemblages within the disposal site prior to disposal operations.

b. To determine if changes occur in the composition and abundance of benthic and demersal assemblages after dredged material disposal, with particular emphasis on the rate of colonization of dredged material mounds by benthic organisms.

c. To determine if changes occur in the composition, abundance, and distribution of plankton as a result of disposal operations.

Experimental Design

10. A cursory review of available literature and discussions with researchers knowledgeable of past investigations of the Galveston study area indicated a gross deficiency of background data; hence, a pilot survey was conducted prior to disposal. The primary objectives of the survey were:

a. To determine the location of previous disposal deposits within the disposal site.

b. To determine spatial variability of selected environmental variables for the selection of experimental disposal areas and reference areas.

11. The designated disposal site was divided into twenty-eight 0.8-km-square grid squares for sampling purposes. From subbottom profiles, bathymetry, sediment samples, and other evidence from the pilot survey, it was found that most previous disposal had been inshore of the designated disposal site.

12. Following the pilot survey, five sampling areas were established within the disposal site. Three of these were designated as experimental areas for the disposal of dredged material; the other two were designated as reference areas for comparative purposes. Within each area, five stations were to be sampled for biological, chemical, and physical parameters. Predisposal, disposal, and postdisposal measurements were taken. Additional details of the experimental design are given in Part IV of this report.

Chronology of Events

13. The Galveston ADFI spanned 4 years (Table 2). The project did not always proceed on schedule because of circumstances which were often beyond the control of the participants. These delays and malfunctions prevented the complete attainment of some project objectives.

Table 2

Chronology of Significant Events Associated with the Galveston ADFI

Date	Event
Dec 1974	Site selection completed.
Jan 1974	Mr. David B. Mathis appointed site manager.
Mar 1975	Contract No. DACW64-75-C-0069 awarded to College of Geosciences, Texas A&M Research Foundation, for "An Investigation of the Hydraulic Regime and Physical Nature of Sedimentation at the Offshore Disposal Site, Galveston, Texas," Drs. Arnold H. Bouma and George L. Huebner, co-principal investigators.
Mar 1975	Contract No. DACW64-75-C-0070 awarded to Moody College of Marine Sciences and Maritime Resources, Texas A&M University, for "An Investigation of the Biota at a Dredged Material Disposal Site," Dr. Donald E. Harper, principal investigator.

(Continued)

Table 2 (Continued)

Date	Event
Mar 1975	Contract No. DACW64-75-C-0071 awarded to The Center for Environmental Studies, The University of Texas at Dallas, for "An Investigation of Water Quality Parameters and Physicochemical Parameters at the Offshore Disposal Site, Galveston, Texas," Dr. G. Fred Lee, principal investigator.
Mar-Apr 1975	Pilot survey completed.
May 1975	Predisposal data obtained at disposal area 2.
May 1975	Disposal terminated at disposal area 2 with no disposal data obtained; postdisposal data obtained.
Jun-Aug 1975	Postdisposal data obtained at disposal area 2; predisposal data at others.
Aug-Sep 1975	Disposal data obtained.
Sep-Dec 1975	Postdisposal data obtained.
Dec 1975	Final report for Contract No. DACW64-75-C-0070 required and received.
Jan 1976	Final report for Contract No. DACW64-75-C-0069 required and received.
Jan-May 1976	Postdisposal data obtained.
Feb 1976	Final reports for Contract Nos. DACW64-75-C-0069 and DACW64-75-C-0070 determined to be inadequate and relegated as internal working documents.
Feb 1976	Contract No. DACW64-76-C-0038 awarded to Texas A&M University, for "An Investigation of Sediment Transport Phenomena and Biological Recolonization at Three Experimental Dredged Material Disposal Sites Offshore from Galveston, Texas," Dr. Donald E. Harper, principal investigator.
Feb-Mar 1976	Unscheduled disposal of dredged material at disposal area 2.
Mar 1976	Final report for Contract No. DACW64-75-C-0071 required.

(Continued)

Table 2 (Concluded)

Date	Event
Apr 1976	Draft report for Contract No. DACW64-75-C-0071 received.
May 1976	Biological field work completed.
Jun 1976	Draft report for Contract No. DACW64-75-C-0071 returned to contractor following review; all field work completed with final bathymetry survey.
Sep 1976	Dr. Thomas D. Wright appointed site manager.
Nov 1976	Final reports for Contract No. DACW64-76-C-0038 required.
Dec 1976-Mar 1977	Review and return of various sections of second draft report for Contract No. DACW64-75-C-0071 as each is received.
May 1977	Draft reports for Contract Nos. DACW64-75-C-0071 and DACW64-76-C-0038 received for editorial review; returned following review.
Jun 1977	Final report for physcial aspects of Contract No. DACW64-76-C-0038 received; draft report for biological aspects returned to contractor following review.
Aug 1977	Final reports for Contract Nos. DACW64-75-C-0071 and biological aspects of DACW64-76-C-0038 received.

PART II: SITE-SPECIFIC LITERATURE

14. There are few comprehensive reports on the Galveston area of use for an ADFI. Among these are the environmental impact statements[4,5] prepared by the U. S. Army Engineer District, Galveston, for maintenance dredging of the channel to Port Bolivar and of Galveston Harbor and Entrance Channel. Copeland and Fruh[6] conducted extensive ecological studies on Galveston Bay which included portions of the Galveston Entrance Channel.

15. The remainder of the literature is generally quite specific with regard to subject. Appropriate references to this literature are given in Appendices A-C.

PART III: DESCRIPTION OF STUDY AREA

Regional Setting

16. Galveston, Tex., is located on Galveston Island, a part of a chain of geologically recent barrier islands that skirt the greater part of the northwestern Gulf of Mexico (Figure 1). The island, which has a northeast-southwesterly trend, is about 48 km long and tapers from an eastern width of about 4 km to a blunt point at the western end. West Bay, which borders most of the landward side of the island, is continuous with Galveston Bay, Trinity Bay, and East Bay, the other bodies of water that constitute the Galveston Bay system. Two jetties, north and south, project into the Gulf in an easterly direction from Bolivar Peninsula and Galveston Island, respectively.

17. There are three legs of the Galveston Bay Channel from which dredged material is removed and deposited offshore: the entrance channel, the outer bar channel, and the inner bar channel (Figure 2). The entrance channel is 7.8 km long, 240 m wide, and has a controlling depth of 12.6 m below mean low water (MLW). The outer bar channel is 1.4 km long, 240 m wide, and has a controlling depth of 12.6 m below MLW. The inner bar channel is 4.4 km long, 240 m wide, and has a controlling depth of 12 m below MLW. The inner and outer bar channels lie entirely within the jetties. Most of the entrance channel is unprotected.

18. The climate of the Galveston area is subtropical, with short mild winters and long hot summers. Summer conditions extend from May through September, with highest temperatures in July and August. Winter conditions occur from December through February. Seasonal air temperature averages are: winter, 13°C; spring, 20.5°C; summer, 28.5°C, and fall, 22°C. The mean annual temperature is approximately 21°C.

19. The trend of the average monthly water temperature is a smooth almost bell-shaped curve. Between November and March, the temperature is usually less than 20°C. In July and August, it is usually above 30°C.

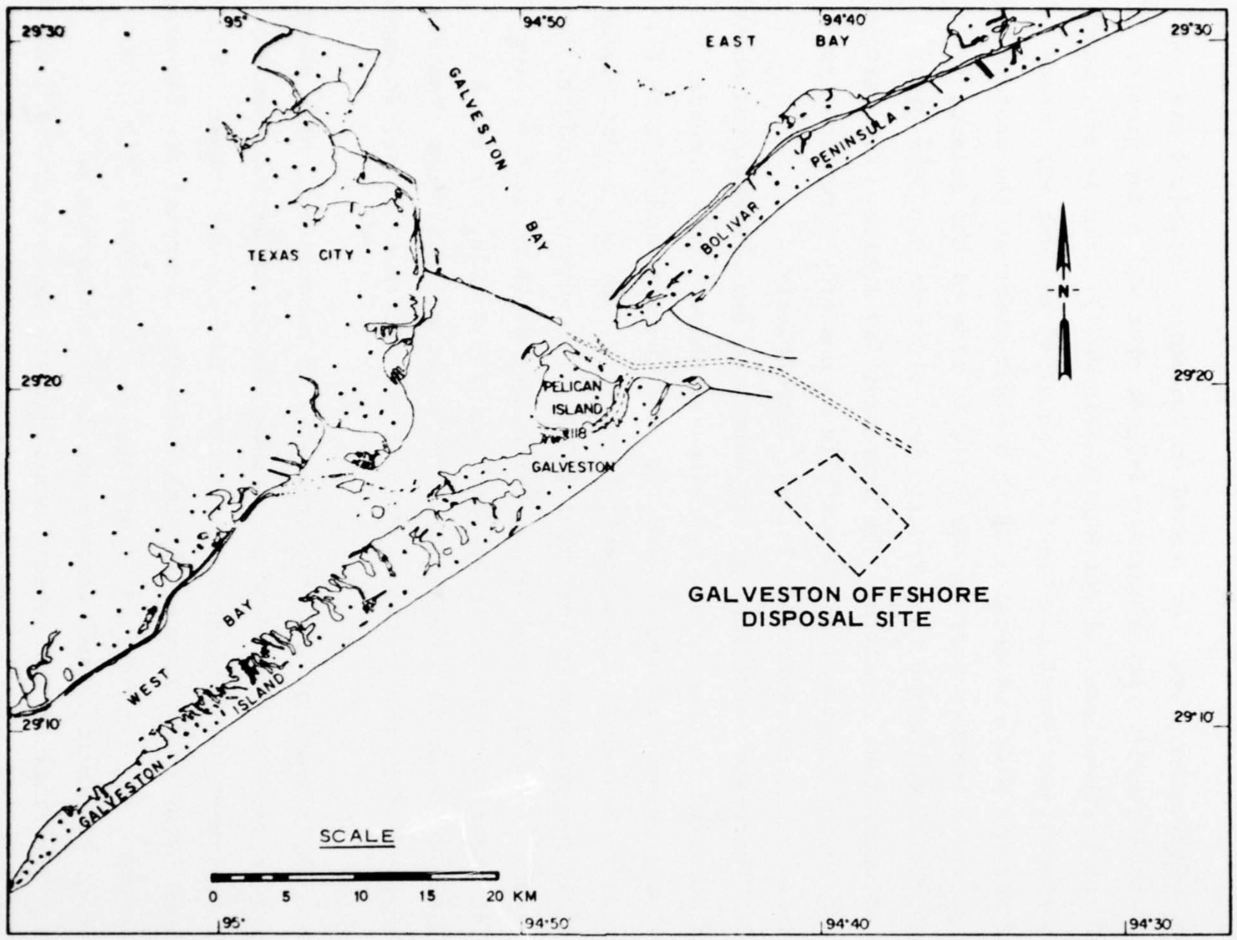

Figure 1. Map of study area

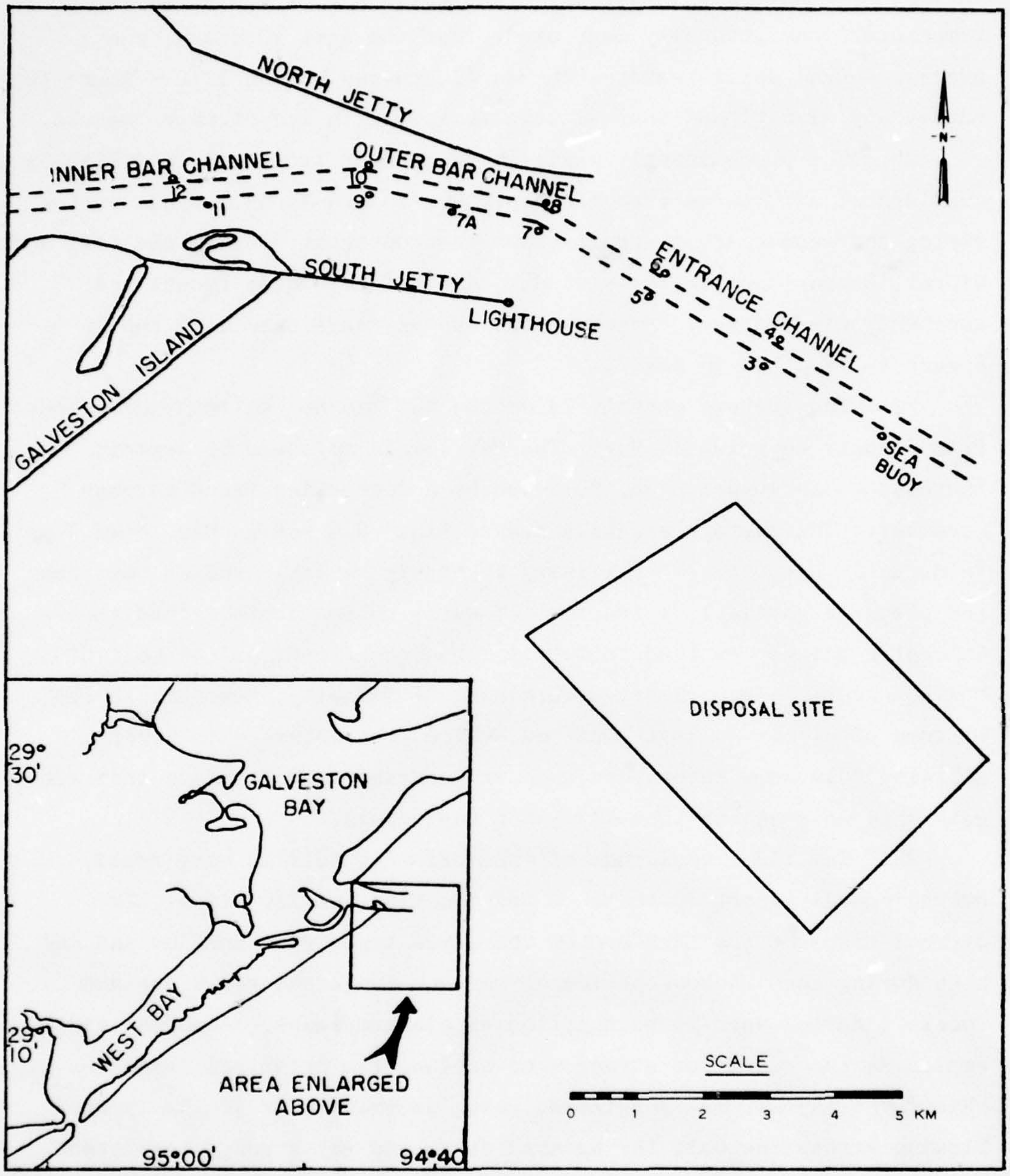

Figure 2. Details of Galveston Bay Channel segment from which material deposited in offshore disposal site is dredged

Comparison of the average water temperatures for the periods 1922 through 1949 and 1950 through 1975 indicates that the average water temperature has gradually decreased. For the past 10 years, the average annual water temperature has fluctuated around 22°C. There is rarely any significant thermal stratification in the offshore waters.

20. The predominantly maritime climate is frequently modified by continental air masses from mid-September to mid-April. Winds during spring and summer are generally from the southeast; during the fall and winter, strong southeasterly winds occur before winter fronts and northerly winds after. Average wind speeds range from 14.5 kph in August to 19.3 kph in April.

21. The average monthly Galveston Bay Channel salinity decreases from January to a low in May. The May low is followed by a rapid increase to an August high, followed by a decreasing trend through December. The average salinity ranges from 20.5 ppt in May to 28.5 ppt in August. Disposal site salinity is highly variable and at any time and place is partially a function of water column depth, since the Galveston Bay waters tend to overlie the more dense, saline Gulf of Mexico waters. The primary determinant of salinity, however, is the mixture of higher salinity Gulf of Mexico open waters with lower salinity Galveston Bay waters and with nearshore Gulf waters that are generally more saline than Galveston Bay waters.

22. The tidal amplitude of the Northwest Gulf is very small, averaging only about 30 to 45 cm between high and low tides. The diurnal tides of the area are of the mixed type, with one low and one high during each 24-hour period of maximum range and two highs and two lows during each 24-hour period of minimum range. Abnormal tidal action is the result of strong wind action, the principal instances of which are: (a) strong, persistent east, southeast, or southerly winds blowing across the Gulf for several days, and (b) strong, persistent north to northwesterly winds after the passage of a vigorous cold front. In the first case, tides may be as much as a metre above normal, while, in the second case, they may be as much as a metre below normal.

23. Currents are determined by the interactions of tides, wind, and freshwater discharge. During flood tide, currents flow into the bay; during ebb tide, they flow out of the bay. There is a long shore current flowing northeast to southwest. Often there are differences in current magnitude and direction for surface, intermediate, and deep waters.

24. Severe climatic events sometimes occur which have an impact on organisms in the Galveston Bay area. One of these events is the passage of a cold front. An especially severe cold front following a period of mild temperature can cause extensive mortalities among the fish and invertebrates. Such severe cold spells occur every few years. Survival during these cold spells depends not on how low the temperature falls but on the temperature prior to the front. If there is a drastic change in temperature, there is usually extensive mortality.

25. Tropical storms and hurricanes have a severe impact on Galveston Bay. On the average, the Galveston area experiences a tropical storm every 4 years, a hurricane every 5 years, and an extreme hurricane every 19 years.

26. The intense wave action associated with hurricanes is an important agent in reworking sediments. Water piled up on the bay by winds rushes back to the sea when wind pressure decreases, causing scouring of existing channels, opening of new channels, and transport of large quantities of sediment into the Gulf. Rain may cause flash floods which decrease the salinity, causing mass mortalities among organisms in the bay.

27. During very high freshwater discharge, Galveston Bay and part of the nearshore Gulf waters can be rendered essentially fresh. The minimum salinity recorded in the Galveston Bay Channel was 0.4 ppt in 1960. Very low salinities can cause drastic changes in the benthic populations and migration of nektonic forms into more saline waters. During periods of low freshwater discharge, saline water invades much of the Galveston Bay system. Salinities in the 20- to 25-ppt range were recently recorded in Trinity Bay and upper Galveston Bay. When

this occurs, high-salinity fauna and flora fill ecological niches vacated by less tolerant biota.

28. Because of nearby Houston and Texas City, Galveston Bay is a heavily utilized port area. Its economic importance stems from its proximity to major population centers in Texas which depend on the bay for transportation of goods, waste disposal, cooling water, recreation, and aesthetic appeal. The Galveston Bay estuarine system is lined with industrial and domestic waste outfalls, urban and agricultural areas, bayous, rivers, and tidal flats in addition to several small shallow embayments. Municipal and industrial effluents and land runoff introduce a substantial amount of material to the bay, some of which is incorporated into the estuarine sediments.

29. The multitude of industrial plants located on the Houston Ship Channel and around Texas City are major potential sources of heavy metals, organics, and other contaminants to the bay. Among these industries are pulp and paper mills; caustic and vinyl chloride plants; metallurgical, electroplating, and other metal production and processing plants; oil refineries; and paint, rubber, fertilizer, and other types of petrochemical plants. Pesticide contamination arises from agricultural and residential use as well as the several pesticide-producing plants located within the bay system.

30. Commercially important invertebrates in the bay include white and brown shrimp, blue crab, and oysters, with all but the latter common at the disposal site. In fact, Galveston Bay constitutes the largest commercial fishery for shrimp and oysters in Texas estuaries. The most important commercial and sport finfish are sand and spotted seatrout, red and black drum, sheepshead, flounder, and croaker. These species occur in the bay and at the disposal site. Because of the close proximity of large population centers, recreational fishing pressure is heavy.

Disposal Site Description

31. The disposal site is located approximately 4.3 km offshore from Galveston. The site is nearly a rectangle 5.6 by 3.2 km (Figure 3). The long axis of the site is oriented northwest-southeast, perpendicular to the coastal trend. It is bounded by parallels $29^{\circ}18.0'$ N and $29^{\circ}14.4'$ N on the north and south corners, respectively, and by parallels $94^{\circ}37.1'$ W and $94^{\circ}41.5'$ W longitude on the east and west corners, respectively. There are no markers delineating the periphery of the site.

32. Depths range from about 10.0 m along the northwestern boundary to about 15.5 m along the southeastern boundary, with the depth contours parallel to the short northeast-southwest axis of the site (Figure 3). There are several mounds northwest of the site which are thought to have resulted from previous disposal.

Dredging Activities

33. Maintenance dredging of the Galveston Bay Channel has been accomplished in recent years by the U. S. Army Corps of Engineers hopper dredge McFARLAND, with a single-load capacity of 2294 m^3. Maintenance dredging involves removal of accumulated sediment from the channel bottom. Dredging is done by lowering a hydraulic suction arm to the bed of the channel while the dredge is under way. Sediment is sucked into the arm and pumped into onboard hopper bins. As the hoppers fill, excess water is vented over the side. The dredged material is transported offshore to the designated disposal site and released by opening the hopper doors while the vessel is under way. The entire hopper load is usually released in a few minutes.

34. From less than 1 million to over 2 million cubic metres of dredged material has been disposed of annually during the past several decades. Prior to 1975, the dredged material was distributed among three disposal sites. One of these was at approximately the same location as the offshore disposal site shown in Figure 3. The other two

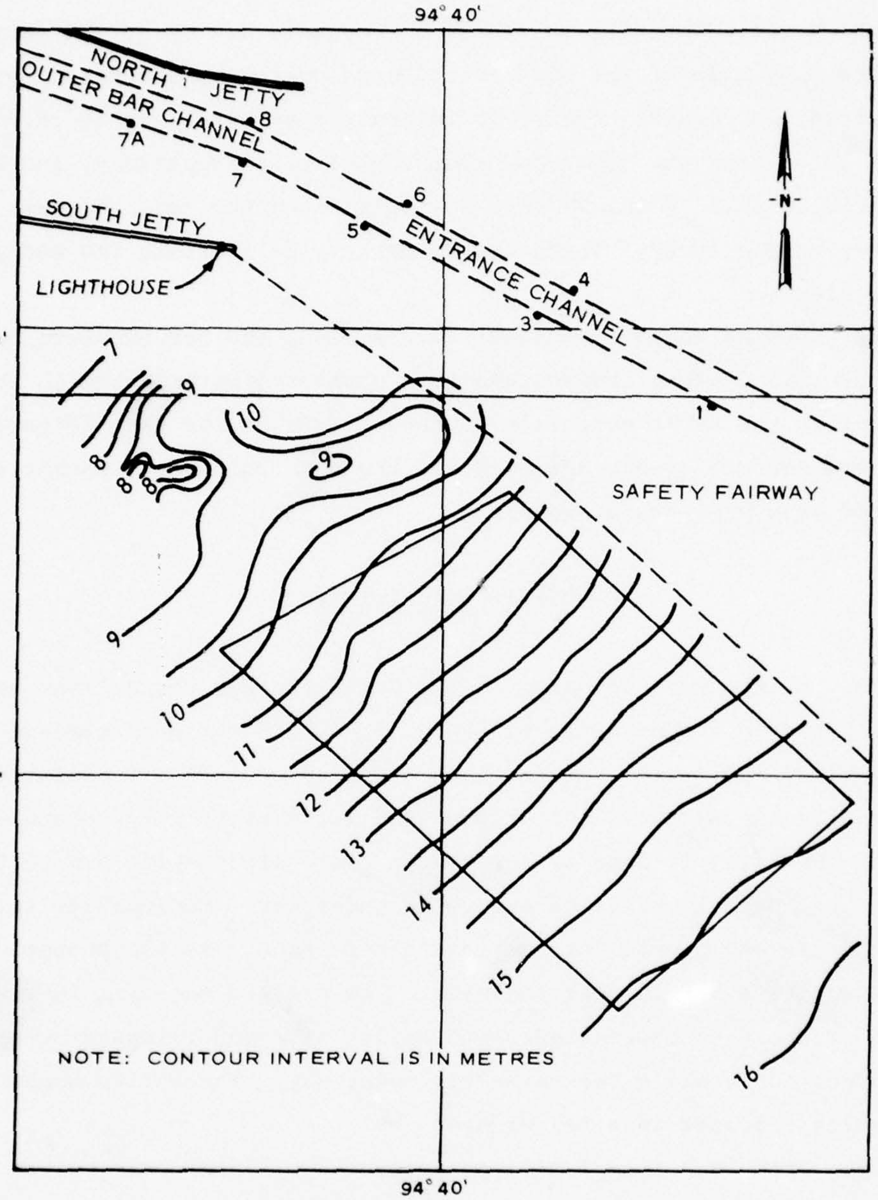

Figure 3. Bathymetry of the disposal site prior to disposal operations (March 1975)

were located adjacent to the entrance channel between buoys 3-4 and 7-8. Other than during the ADFI, no data are available on the amount of sediment disposed of at the currently designated disposal site. It is thought to have been minimal because of the longer distances involved in the transport of the sediments from the channel to the disposal site. After 1973, all dredged material from the entrance channel was supposed to be placed in the designated disposal site.

35. The bathymetry of the disposal site demonstrates little or no evidence of previous dredged material disposal. The previously noted mounds are outside of the designated disposal site. Since approximately 1.4 million cubic metres per year has been disposed of in this general area for the past several years, the lack of evidence of its presence would indicate that there is rapid dispersion of the dredged material after disposal or that most disposal occurred outside the designated site.

36. The amount of material dredged from the entrance channel in recent years has been somewhat variable. Estimated amounts and the disposal locations are given in Table 3.

Table 3

Estimated Amounts of Material Dredged from the Galveston Bay Channel and Disposed of In or Near the Disposal Site

Date	Material Dredged (m^3)	Disposal Area
1-13 Oct 1973	111,300	Unknown. Possibly sampling area 2
23 Jan-20 May 1974	796,000	Unknown. Possibly sampling area 2
18 Jul-24 Sep 1974	1,301,600	Unknown. Possibly sampling area 2
7-13 May 1975	88,100	Sampling area 2
24 Aug-24 Sep 1975	223,900	Sampling area 2
24 Aug-24 Sep 1975	73,100	Sampling area 12
24 Aug-24 Sep 1975	197,600	Sampling area 14
9-10 Oct 1975	2,300*	Sampling area 2-A
18 Feb-3 Mar 1976	211,200	Sampling area 2

* This material was dredged from the Texas City Turning Basin.

PART IV: METHODS AND MATERIALS

37. The Galveston ADFI consisted of a pilot study and predisposal, disposal, and postdisposal phases. These divisions were not, however, entirely consistent, and distinctions between them in the contractor-prepared reports (Appendices A-C) are not always made. In general, all work done prior to 7 May 1975 is considered to be part of the pilot study, though it was also predisposal. Disposal began at area 2 on 8 May and was terminated after the disposal of 88,100 m^3 of material. Hence, data obtained from area 2 after that time are postdisposal rather than predisposal.

38. Sample collection and analysis procedures used during the pilot study were not always comparable to those used in later phases of the investigation. For example, different sieve sizes were employed to concentrate macrobenthic organisms in the pilot than in the other three phases; a pump was employed for phytoplankton sampling during the pilot study, but a sampling bottle (Van Dorn) was used in later phases; and three different devices were used to collect sediment for physical analyses during the pilot study and predisposal phase. Hence, it is not always appropriate to combine data from the pilot study and the predisposal phase.

39. The overall experimental design was quite straightforward. In or near the disposal site, four sampling areas were selected to evaluate the effects of the disposal of several types of sediment. Two reference areas were chosen to provide comparative data. It had initially been planned to use the centers of areas 2, 12, and 14 (from the pilot study) as the primary disposal areas and the centers of areas 15 and 27 as reference areas. Five sampling stations were located in the vicinity of the disposal and reference areas (except area 2-A). Buoys were positioned at the disposal areas prior to the August-September disposal operations. The locations of the buoys and sampling stations in the disposal and reference areas are given in Figure 4 and the characteristics of the areas are listed in Table 4.

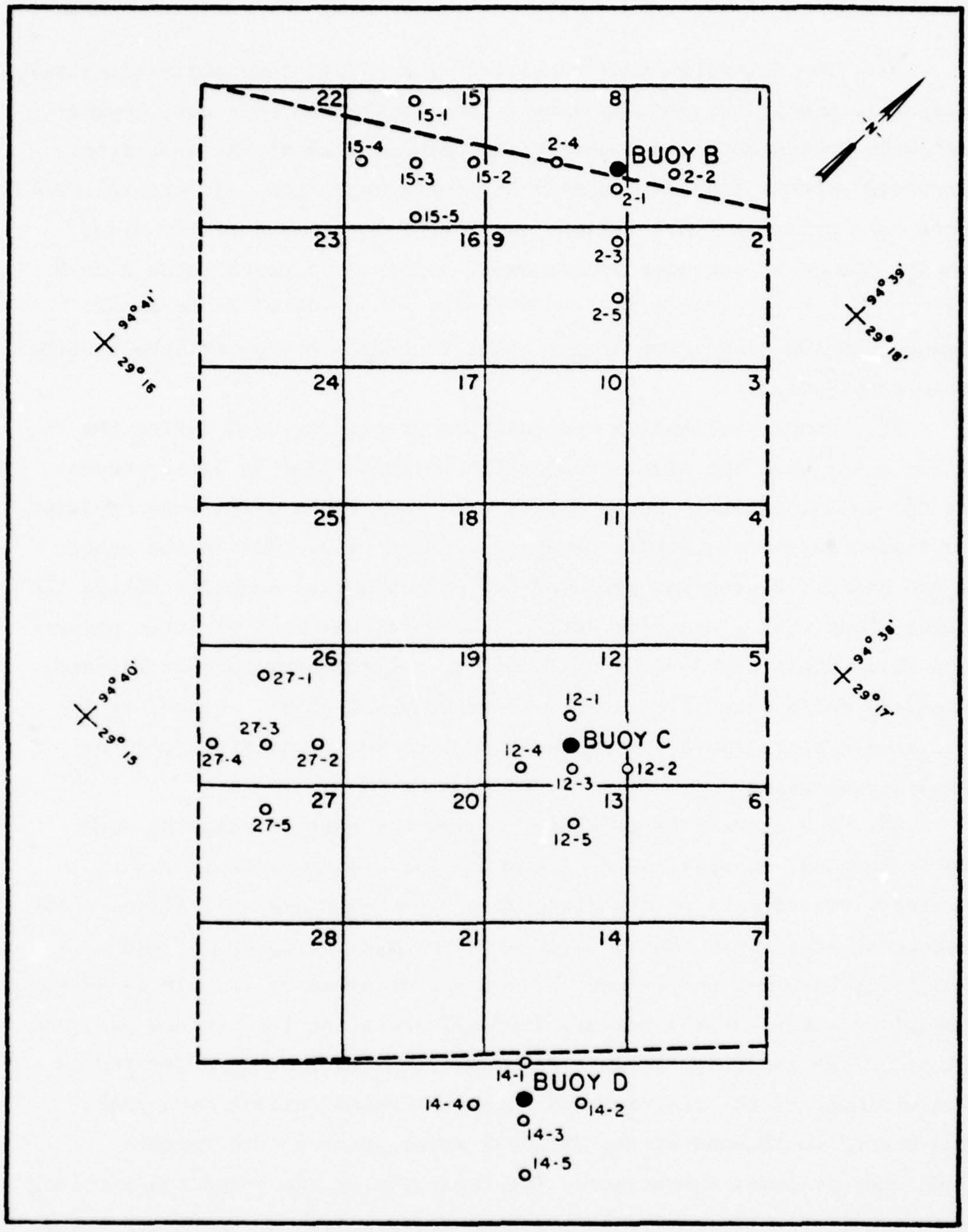

Figure 4. Locations of buoys and sampling stations in the disposal and reference areas

Table 4

Characteristics of the

Disposal and Reference Areas

Designation* No.	Type Area	Bottom Type	Depth	Disposal Frequency	Disposal Material
2	Disposal	Silty sand over silty clay	Within wave action	Often	Uncontaminated sand, silt, and clay
2A	Disposal	Silty sand over silty clay	Within wave action	Once	Contaminated silt and clay
15	Reference	Silty sand over silty clay	Within wave action	NA**	None
12	Disposal	Silty clay	Below wave action	Once	Uncontaminated sand
14	Disposal	Silty clay	Below wave action	Once	Uncontaminated sand and clay
27	Reference	Silty clay	Below wave action	NA	None

* Locations of disposal and reference areas are shown in Figure 4.

** Not applicable.

40. Replicate predisposal and postdisposal physical, chemical, and biological samples were to be concurrently obtained from each of the stations. Water quality studies were to be performed during disposal. In addition, numerous other tasks (such as current measurements, bathymetry surveys, sediment movement measurements, etc.) to determine the effects of disposal were planned.

41. Because of the number of different contractors and a general lack of coordination, only a very limited amount of concomitant data were collected. Other than in a few isolated instances, the concomitant data consists of benthic macroinvertebrate and grain-size data for January, April, and May 1976. The remainder of the data were generally taken at different places, different times, or both. Descriptions of actual sampling stations for physical, chemical, and biological variables are given in the Appendixes.

42. It was initially planned to use a precision electronic navigation system for position location when sampling. The distance offshore of the disposal and reference stations, together with commonly prevailing atmospheric conditions (haze, etc.), required some such system so that samples could be taken at or as near the same position as possible during each sampling period.

43. The system was functional only for two bathymetric surveys and the pilot physical studies. During the remainder of the investigation, the three buoys at the disposal areas served as reference points, for three stations with samples being taken adjacent to the buoys. Dead reckoning was used to locate the other 22 stations. No estimates of the variability or accuracy of this method are available, but it is not thought to be especially precise. Hence, other than when the electronic navigation system was operable, samples were taken in a general area rather than at a precise location.

44. Several contractors were involved in the physical and chemical aspects of the Galveston ADFI. The field and laboratory methods used by the first physical contractor are given by the second physical contractor in Appendix A. Field and laboratory chemical methods used by the first contractor are given in Appendix B. Those chemical methods

used by the second contractor are not reported because initial handling of the samples and subsequent analyses invalidated the results. Biological field and laboratory methods are given in Appendix C.

45. Physical, chemical, and biological field and laboratory procedures are given in Table 5. For detailed information on procedures the appropriate Appendices should be consulted, since, for example, sediments were collected with three different devices by various contractors and all three were sometimes utilized during a given sampling period. Likewise, samples were often subsampled by assorted techniques to provide material for analyses other than that for which the sample was primarily collected.

Table 5

Field and Laboratory Methods Used in the Collection and Analysis of Physical, Chemical, and Biological Data

Variable	Procedure
Physical Study Variables	
Field Procedures	
Bathymetry	200-kHz side-scan sonar, fathometer
Currents	Bendix Q-15 meter, Braincon Savonius meter
Remote sensing of turbidity	Aerial photography with Eastman-Kodak Ektachrome infrared film
Sediment collecting	136-kg gravity corer, Van Veen grab, 3/4-size Reineck spade corer
Sediment tracing	Sand grains coated with fluorescent dye
Subbottom profiles	3.5-kHz high-resolution system
Suspended sediment	Pump
Laboratory Procedures	
Carbonate	Sheibler volumetric technique
Clay mineralogy	X-ray diffraction
Critical erosion velocity, shear stress, transport mode	Flume

(Continued)

Table 5 (Continued)

Variable	Procedure
	Laboratory Procedures (Continued)
Grain size	Sieve and pipette
Heavy metals	Bromoform separation and optical analysis
Organic matter	Weight loss after combustion (600°C for 2 hours)
	Chemical Study Variables
	Field Procedures (Water)
Conductivity	6-D Hydrolab Surveyor
Dissolved oxygen	6-D Hydrolab Surveyor
Light transmission	Transmissometer
pH	6-D Hydrolab Surveyor
Sample collection	Van Dorn sampler, submersible pump
Temperature	6-D Hydrolab Surveyor
Turbidity	Secchi disk
	Field Procedures (Sediment)
Sediment collection	Ponar grab, Peterson grab, 3/4-size Reineck spade corer
	Laboratory Procedures (Water)
Ammonium	Specific ion electrode
As, Cd, Cr, Cu, Fe, Hg, Mn, Ni, Pb, Zn	Atomic absorption spectrophotometry
Carbon	Organic carbon analyzer
Nitrate	Brucine method
Oil and grease	Solvent extraction (EPA)
Organic nitrogen	Subtraction of ammonium from Kjeldahl nitrogen
Pesticides and PCB's	Electron capture gas chromatography
Phosphorous	Ascorbic acid method
Turbidity	Hach turbidimeter

(Continued)

Table 5 (Continued)

Variable	Procedure
	Laboratory Procedures (Sediment)
Ammonium	Specific ion electrode
As, Ce, Cr, Cu, Fe, Hg, Mn, Ni, Pb, Zn	Atomic absorption spectrophotometry
Carbon	Organic carbon analyzer
Cation exchange capacity	Ammonia saturation
Interstitial water collection	Centrifugation
Moisture content	Weight loss after drying (60°C for 24 hours)
Oil and grease	Solvent extraction (EPA)
Organic nitrogen	Subtraction of ammonium from Kjeldahl nitrogen
Oxygen demand test	Membrane electrode
Particle size	Hydrometer method
Pesticides and PCB's	Electron capture gas chromatography
pH	pH meter
Phosphorus	Ascorbic acid method
Redox potential	Platinum electrode
Sulfide	Iodometric titration
	Laboratory Procedures (Organisms)
As, Cd, Cr, Cu, Fe, Mn, Ni, Pb, Zn	Atomic absorption spectrophotometry
Pesticides and PCB's	Electron capture gas chromatography
	Biological Study Variables
	Field Procedures
Macrobenthos	Van Veen grab, spade corer
Meiobenthos	Subsampled with 4.9-cm-diam tube from macrobenthos
Nekton	Otter trawl
Phytoplankton	Pump, Van Dorn sampler
Zooplankton	Plankton net

(Continued)

Table 5 (Concluded)

Variable	Procedure
	Laboratory Procedures
Macrobenthos	1.0-mm or 0.5-mm sieve
Meiobenthos	0.5-mm sieve followed by 0.062-μm sieve
Nekton	Wet weight biomass, length in 1-, 5-, or 10-cm increments
Phytoplankton	Fluorometric with acetone extraction
Zooplankton	Displacement volume

PART V: RESULTS AND DISCUSSION

Physical Studies

Bathymetry

46. The predisposal bathymetric surveys of the Galveston disposal site revealed a featureless, gently sloping bottom, except in the northernmost section. This had a topographic high believed to be dredged material. After disposal, additional bathymetric surveys at disposal areas 2, 12, and 14 indicated that definite mounds of dredged material had formed. Because of variable navigation techniques, only crude estimates of the mound volume at each area could be made (see Appendix A). Moreover, inadequate documentation on the hopper dredge log sheets of which area was used for each disposal operation precluded accurate determination of actual volumes disposed of at each area. However, using daily records and assuming specific travel times to each area, the following estimates were made of volumes of dredged material disposed of at each area prior to October 1975:

Disposal Area	Estimated Volume m^3	Measured Volume m^3	Percent Accounted for
2	223,900	137,664	61
12	73,075	69,468	95
14	197,640	163,200	83

By June 1976, the estimated in-place dredged material volumes were 64,900, 61,170, and 163,200 m^3 at areas 2, 12, and 14, respectively. Thus, the mound at area 12 was reduced by approximately 8,300 m^3, and there was a substantial loss of volume of area 2 considering that an additional 211,200 m^3 of material was disposed of at area 2 in late winter of 1976.

47. From comparisons of mound configurations with time, a qualitative indication of the degree of erosion at each area was made. Area 2 experienced the most pronounced erosion and had mounds of low relief. The area 12 mound was circular, with 0.3 m of relief and an approximate diameter of 400 m. The area 14 mound probably experienced little

redistribution of material because of the continued presence of a steep, pointed mound with a relief of approximately 2.4 m. Some of the changes in all of the areas may have resulted from compaction and dewatering of the dredged material.

Sediment distribution

48. Evaluation of sediment samples taken during the pilot study and the predisposal period within the disposal site indicated a highly variable distribution of sandy silts and sand. Few results pertaining to predisposal sediment distribution in the disposal site can be considered useful for any evaluation of potential changes after disposal because of the few sampling stations within the site. However, some rather broad generalizations can be made from the postdisposal sediment data from the individual disposal areas.

49. The variability of sand, silt, and clay percentages between replicate samples was so great that comparisons between stations are almost impossible (see Table 4, Appendix A). This variability is indicative of dredged material deposits but was also observed for the two reference areas. Relative changes in carbonate content after disposal from samples taken on the dredged material mounds indicated a general decrease in concentration, except at area 12 where a substantial increase was observed. All of the carbonate concentrations of samples from the mounds were substantially higher than those found at the reference stations and most of the stations off of the dredged material mounds. The extremely high carbonate values at area 12 suggest a low-energy winnowing of fine material with little bed-load transport. This conclusion is substantiated by the small volume reduction (about 8300 m^3) and the general decrease in average grain size to the west. The sediments at area 14 experienced little change in mean grain size during the postdisposal period.

Circulation and transport

50. As stated previously, the diurnal tides of the Galveston area are of the mixed type, with one low and one high per 24-hour period of maximum range and two highs and two lows per 24-hour period of minimum range. These two tides can be designated as tropical tides and

equatorial tides, respectively. The water level variation coincident with this cycling of tides generates the largest exchange of water between the bays and the Gulf and has a direct effect on current velocities within the disposal site.

51. The wind can cause noticeable fluctuations in the primary tidal oscillations and, consequently, may modify the circulation of the nearshore Gulf waters. Prolonged southeasterly winds can effectively "set up" the water level along the coast and within the bays, dampen the tidal forces, and force the nearshore shelf waters into a nearly unidirectional alongshore flow toward the southwest. Maximum current velocities of 90 cm/sec were measured within the disposal site during a period of prolonged southeasterly winds. Local shrimpers and fishermen indicated that a southwest-trending coastal current is generally present for most of the year offshore from Galveston. Annual sea surface data and synoptic meteorological observations indicate that the winds are predominently from the southeast for most of the year.

52. The disposal site thus experiences tidally-induced flows which tend to be rotary at the surface and primarily northeast-southwest near the bottom. Superimposed on this current, semipermanent southwest-flowing nearshelf currents and wave-induced bottom oscillatory currents may develop a flow regime with velocities in excess of 90 cm/sec in the near-bottom waters which can effectively cause erosion, resuspension, and transport of dredged material. Analysis of near-bottom current measurements indicates that median velocities at area 2 were approximately 28 cm/sec and at area 14 were about 20 cm/sec; both areas experienced velocities greater than 70 cm/sec at 1 m above the bed.

53. These data and other observations indicate that the Galveston disposal site experiences an energy gradient dependent upon depth and proximity to shore. This is evident from the net changes in mound configuration and sediment distribution at disposal areas 2, 12, and 14. Area 2 was predominantly an erosion zone with high median velocities, pronounced reductions in mound volume, and high-velocity tidal currents and wave-induced oscillatory currents. Sand tracer studies at area 2 indicated an effective southwesterly transport of the dyed materials,

with substantial reworking of the sediments. Area 12 had a more stratified flow distribution, with a net southwesterly drift and a slightly reduced median velocity. Erosion and transport of fine sand and silt could occur in area 12 but not to the extent of that in area 2. The high postdisposal carbonate concentrations suggest that winnowing was effectively removing the fine-grained fraction of dredged material. Area 14 (in deeper water) probably experienced little change in volume during the period between September 1975 and June 1976. The mound experienced generally lower velocity currents which did not change its configuration. Grain-size data suggest an increase in the finer fractions; this implies that depositional velocities were prevalent at the site.

54. Thus, the Galveston disposal site can be categorized into two energy-related disposal sites. The shallow, nearshore, high-energy portion could be used for nonpolluted entrance channel material which would be effectively reworked and transported out of the site by natural processes. This would help to maintain the natural southwest-trending alongshore movement of nearshore sands which become trapped in the entrance channel system. This portion of the disposal site would naturally have a capacity for large volumes of uncontaminated dredged material.

55. The offshore lower-energy portion of the disposal site would be more suitable for fine-grained, contaminated dredged material which should remain in situ. A potentially effective management technique to assure the stability of fine-grained dredged material is use of the cohesive high-density Beaumont clay, found in the outer bar portion of the channel, as a capping material for the contaminated mounds. Although the Galveston disposal site has not been investigated for an extended period of time to assure the stability of dredged materal in the outer portion, the available data indicate that these assumptions are valid for disposal.

Chemical Studies (Water Column)

Short-term effects

56. During this discussion of short-term water quality alterations, two situations which could potentially result in harm to aquatic organisms will be considered. One of these is the worst-case situation; a planktonic or nektonic organism moves with or remains within the turbid plume until the plume disperses. The other case involves non-motile organisms that the plume passes or nektonic organisms which may swim through the turbid plume and thus receive a short-term exposure.

57. The evaluation of the worst-case situation (movement with the turbid plume) was difficult because of the sampling procedure used. The sampling vessel was anchored, and soluble constituents associated with the turbid plume were sampled as the turbid plume passed under the boat. This did not permit estimation of the rate of dilution of contaminants released from the dredged material. To obtain this information, multiple sampling stations at varying distances from the point of disposal would have been required.

58. Optical properties. The data collected during the disposal operation indicated that a well-defined distribution of suspended material occurred in the water column immediately after the disposal of dredged sediments. In general, the surface and middepth plumes were short-lived, lasting 2 to 15 minutes at any one location near the disposal area. The bottom plume was often more turbid than either the surface or the middepth plume and lasted from 10 minutes to well over 1 hour. The persistance of the bottom plume may have been caused by bottom currents which dislodged previously deposited sediments to create a plume which traveled along the bottom. Surveys conducted some 12 hours after cessation of disposal indicated that the bottom plume was relatively short-lived.

59. Overflights indicated that the turbid surface plume generally persisted for 1 hour or less. Even for organisms moving with the plume, such short-term exposure should not result in harm to the organisms. Peddicord et al.[7] have reported that, in general, aquatic organisms are

insensitive to concentrations of suspended solids greater than those normally associated with disposal operations. Many aquatic organisms are adversely affected only by concentrations in the grams per litre range and greater and, even then, only when these levels persist for several days or weeks.

60. Dissolved oxygen. Decreased concentrations of dissolved oxygen were noted in all but four of the disposal operations. Only once during the disposal operations did the dissolved oxygen concentration fall below the 5.0-mg/ℓ lower limit proposed by the U. S. Environmental Protection Agency (EPA).[8] This level of dissolved oxygen is considered to be the minimum concentration required by many aquatic organisms. During Texas City disposal number 2, ambient dissolved oxygen concentrations in the bottom waters were such that a dissolved oxygen decrease of 1.5 mg/ℓ during disposal reduced dissolved oxygen concentrations to slightly over 4 mg/ℓ. This dissolved oxygen depletion was of short duration (minutes), and it is doubtful that the depletion would have had a significant effect on pelagic organisms passing through or moving with the plume.

61. Heavy metals. During the disposal operations, elevated concentrations of some heavy metals were observed in the water column. However, as with other toxicants, it is important to consider the available concentration and exposure time. The aqueous environmental chemistry of many heavy metals is such that, with few exceptions, the predominant forms present in natural waters are in a relatively unavailable and nontoxic state. This is especially true for sediments where binding of the heavy metals to the sediment would generally be expected to greatly reduce mobility and possibly eliminate any toxicity toward most aquatic species.

62. Manganese concentrations increased in the water column during seven of the nine monitored disposal operations. This development agrees with results found by Lee et al.[9] with elutriate tests on Galveston Bay Channel and Texas City Turning Basin sediments where manganese was the only heavy metal that exhibited the potential for release of significant amounts. The magnitude of manganese release

varied between disposal operations and seemed to be independent of other variables. Galveston Bay Channel disposal 5 showed the greatest release, as moderately elevated manganese concentrations (105 to 190 mg/ℓ) persisted in bottom waters for at least 35 minutes after disposal. When one considers the 35-minute period of time a nonmotile organism could be in contact with concentrations of manganese above the ambient exposure level (100 μg/ℓ, EPA[8]) for protection of consumers of marine mollusks, it seems unlikely that the release of manganese would have a detrimental effect on water quality. No criteria are available for manganese in marine waters other than the exposure level for marine mollusks. However, tolerance values reported for freshwater aquatic life range from 1.5 mg/ℓ to 100 mg/ℓ.[8] The slightly elevated manganese concentrations found in the water following the disposal of dredged materials do not appear to pose any problems to marine organisms.

63. Increases in concentrations of nickel, cadmium, and mercury were noted in the water column following the disposal of dredged material during a few disposal operations. The magnitude of the release was minor, however, and did not exceed the safe chronic exposure levels recommended by the EPA[8] for cadmium and mercury. (No numerical criteria are available for nickel.) Release into the water column was small (usually less than 10 μg/ℓ) and would therefore not have an adverse effect on water quality at the disposal site.

64. Nitrogen compounds. The primary concern over nitrogen compounds in dredged sediments is related to the amount of ammonia* released to the water column during disposal. Of the various nitrogenous compounds present in dredged sediments, ammonia represents the greatest potential hazard to aquatic life.[10]

65. The magnitude of ammonium-N release from the contaminated Texas City sediments into the water column was greater than the release of ammonium-N into the water column during the disposal of Galveston

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* For the purposes of their study this form as nitrogen was measured as ammonium (NH_4^+)-N, and the more toxic ammonia (NH_3)-N was calculated from the concentration of NH_4^+-N at a given pH.

Bay Channel sediments. This was expected because of the much higher interstitial water ammonium-N concentrations in Texas City sediments than in Galveston Bay Channel sediments.

66. Under the temperature, pH, and salinity conditions found in the water, un-ionized ammonia concentrations exceeded the EPA[8] criteria of 0.02 mg/ℓ only during Texas City disposal 2. Calculations of un-ionized ammonia concentrations from ammonium-N concentrations by the method of Thurston et al.[11] were made assuming a pH of 8, salinity of 25 ppt, and temperature of 22^{o}C in the disposal site bottom water. Using these criteria, the un-ionized ammonia concentration reached 0.06 mg/ℓ when ammonium-N concentrations were at a maximum of 1.86 mg/ℓ. These high concentrations of un-ionized ammonia persisted for less than 2 minutes before declining to levels of 0.025 mg/ℓ or less. Un-ionized ammonia concentrations in bottom waters exceeded the safe chronic exposure level for approximately 12 minutes. It is doubtful that such a short exposure to moderately elevated un-ionized ammonia concentrations would result in harm to nonmotile organisms exposed for the entire 12 minutes or to organisms swimming through the plume.

67. It must be remembered that the safe chronic exposure criteria[8] specify concentrations of water constituents which will provide for the protection and propagation of fish and other aquatic life and for recreation in and on the water. Concentrations considerably greater than the chronic exposure criteria can be allowed for short periods of time without having a significant adverse effect on water quality. The exposure criterion used for un-ionized ammonia or any other parameter must exceed the critical concentration time of exposure relationship for an organism of interest in the water column before any harm to the organism will occur.

68. An example of the importance of the concentration time of exposure relationship was demonstrated by Mattice and Zittle[12] in a literature review on the impact of chlorine on aquatic organisms. They determined that, for marine organisms of the types they tested, the acute safe level of chlorine for a 1-minute exposure was approximately 0.15 mg/ℓ. For 10 minutes of exposure, the safe level for acute toxicity

was approximately 0.06 mg/ℓ, while, for 100 minutes of exposure, the safe level was approximately 0.03 mg/ℓ. They also reported that a chronic safe level for chlorine was about 0.02 mg/ℓ.

69. The importance of these results is that a doubling of the safe acute toxicity level is achieved when the exposure time is reduced from 100 to 10 minutes. Decreasing the duration of exposure from 100 to 10 minutes increases the acute toxicity threshold from approximately 0.04 mg/ℓ to 0.2 mg/ℓ chlorine.[12]

70. It is impossible to reach any conclusions regarding the fate of organisms moving with the plume because of the unknown rate of dilution of the plume. Water in the plume will, however, mix with water containing lower ammonium-N concentrations. It was determined in the physical studies that bottom currents tend to mix the plume with water masses of lower ammonium-N concentrations. In a shallow-water area such as the disposal site, turbulent diffusion is sufficient for rapid mixing of water column constituents. Ammonium-N concentrations in the turbid plume would, therefore, be expected to decrease rapidly.

71. Bioassay studies[9] were conducted to determine the toxicity of sediments disposed of in the Galveston disposal site. Elutriates of sediment from the Galveston Bay Channel and Texas City Turning Basin were evaluated for toxicity to *Paleomonetes pugio* (grass shrimp) in a 96-hour bioassay. Little toxicity was demonstrated by the dredged material from either the Galveston Bay Channel or the Texas City Turning Basin.

72. Increased concentrations of organic-N were found in the turbid plumes. This development was expected since organic-N in natural water systems occurs primarily in a particulate form. No water quality significance can be attached to a certain concentration of organic-N in natural waters. It is very unlikely that the organic-N associated with the turbid plume would cause any water quality problems as a result of its conversion to ammonia. In the study area, the conversion of organic nitrogen to ammonia would be slow (weeks or months). Thus, any ammonia would be dispersed in Gulf waters so that it would not adversely affect aquatic life. In addition, the ammonia-N would rapidly convert

to nitrate-N.

73. Nitrate-N is not normally present in anaerobic bottom sediments. Under the reducing conditions that prevail in the Texas City and Galveston sediments, any nitrate-N present in the interstitial waters should be rapidly denitrified. During several disposal operations, the nitrate concentration increased. This result might have been due to a positive interference in the nitrate analyses of iron, manganese, or other materials. However, if the observed nitrate increase was real, there should have been no adverse effect on water quality.

74. Phosphorus compounds. Phosphorus is of concern in dredged material disposal primarily because, in phosphorus-limited waters, certain forms of this element can stimulate the growth of aquatic plants. The seagrasses and benthic algae of the Gulf of Mexico serve as valuable food sources and habitats for fishes and invertebrates. However, massive amounts of algae occur seasonally at shallow depths in the Gulf and may become nuisances.[13]

75. Data from nine disposal operations indicated that the direction and degree of change in soluble orthophosphate concentrations during disposal were unrelated to either the disposal area or the sediment source in question. The general trend was for concentrations of soluble orthophosphate-P to increase and rapidly return to ambient levels. Where these increases occurred, they ranged from 2- to 55-fold and appeared to be quite localized. Frequently, however, no increase was found in the surface waters. The increases in soluble orthophosphate-P were such that no stimulation of photosynthetic activity would be expected because of the compensation depth.

76. Texas City sediments released less orthophosphate-P than did Galveston Bay Channel sediments. In some cases, Texas City sediments appeared to remove orthophosphate-P from the water column by sorption and/or precipitation. This may have been related to the higher ambient orthophosphate-P concentrations in disposal site waters prior to disposal of Texas City sediments. The Texas City sediments may also have contained more soluble ferrous iron than Galveston Bay Channel sediments. This would result in the increased removal of orthophosphate-P by ferric

hydroxide formation during disposal of Texas City sediments.[14]

Long-term effects

77. Optical properties. No evaluation of the long-term effect of dredged material disposal on optical properties could be conducted because of inadequate data. However, the ambient turbidity was generally so great that the disposal of dredged material would be very unlikely to alter water quality.

78. Dissolved oxygen. There were no observed long-term effects on dissolved oxygen concentrations in the disposal site water column. Results of the postdisposal surveys indicated that dissolved oxygen concentrations in the water column immediately above the disposal site were essentially the same as predisposal and reference area concentrations.

79. Heavy metals. The results indicated that disposal of dredged material caused no long-term release of heavy metals to the disposal site water column.

80. Nitrogen compounds. Only ammonium-N concentrations were evaluated in postdisposal water samples. Ammonium-N concentrations were not greater than 0.05 mg/ℓ and were comparable to predisposal levels.

81. Phosphorus compounds. Postdisposal orthophosphate-P concentrations in the water column were generally 2.5 to 22 times greater than those observed before and during disposal. Similar increases were observed in the reference areas which indicates that these increases reflect normal variation.

82. There are several reasons why changes in soluble orthophosphate concentrations resulting from dredged material disposal probably have little ecological significance. First, it has been shown by Ryther and Dunstan[15] and Copeland and Fruh[6] that nitrogen limits algal growth in the coastal marine environment and in Galveston Bay waters. Copeland and Fruh[6] further state that growth of aquatic plants in Galveston Bay is most likely limited by the presence of toxic substances rather than by a lack of nutrients.

83. As shown by the predisposal data, soluble orthophosphate-P

concentrations were generally 0.01 mg P/ℓ or higher, whereas inorganic-N (NH_3-N + NO_3^--N) concentrations were usually well below 0.3 mg N/ℓ. Concentrations of 0.01 mg P/ℓ and 0.3 mg N/ℓ are usually regarded as the critical limiting factor for algal growth.[6,16,17] In addition, the ratios (available N:available P) were generally less than 10:1 (atomic ratio), indicating that nitrogen would likely become limiting before phosphorus. Nitrogen concentrations in 7 May samples were above the 0.3-mg N/ℓ level, while soluble orthophosphate-P concentrations remained in the same range as found on other sampling dates. In most of these cases, the N:P ratio was still below 10:1 (atomic ratio). Several samples collected at the disposal site on 17 April showed N:P ratios as great as 39:1 (atomic ratio), indicating the possibility of phosphorus limitation before nitrogen limitation if other conditions favored algal growth. Subsequently, eutrophic conditions did not exist as a result of disposal.

Chemical Studies (Sediments)

84. The sampling program was conducted in such a manner that only long-term alteration of sediment properties by dredged material disposal could be evaluated. Also, with the exception of ammonium-N analyses, only total analyses (bulk sediment analyses) were conducted on the disposal site sediments. Therefore, no evaluation of possible changes in the mobile forms of contaminants other than ammonium-N could be made.

85. It is assumed that the data are representative of the general properties in an area at the time of sampling. However, it is known that natural sediments in areas such as that near the Galveston Bay Channel tend to be highly variable in composition and are influenced by storms and ship traffic. It is also likely that the characteristics of the sediments changed during the course of the study due to factors other than dredged material disposal. This conclusion is reinforced by significant differences in predisposal and postdisposal trace metal and sulfide concentrations in the reference areas.

86. There was no increase in concentrations of trace metals or nitrogen compounds in disposal site sediments where dredged material

disposal had occurred. Total mercury concentrations increased in reference area 27 (compared to predisposal concentrations) although there was no dredged material disposal in this reference area. A decrease in trace metal concentration was noted following disposal.

87. Decreased trace metal concentrations in sediments where disposal occurred may have been due to transport of finer sediment particles and associated trace metals out of the disposal areas by currents. This is supported by the presence of lower concentrations of trace metals in sediment mounds created by disposal than in sediments immediately adjacent to the mounds.

88. It can be concluded that disposal operations at the Galveston disposal site resulted in no major changes in the concentrations of chemical parameters measured in this study. In addition, no major changes in pH, Eh, or percent solids were noted in disposal site sediments.

Biological Studies

Phytoplankton

89. Phytoplankton samples for pigment analysis (chlorophyll-a and phaeophytin) were collected with an on-deck pumping system during the pilot study. The resulting samples contained numerous ruptured cells which the contractor attributed to the effect of suspended particulate matter as the cells passed through the pump impeller. Thus, phytoplankton data from the pilot study were not analyzed.

90. Samples for pigment analysis were obtained with a Van Dorn sampler during the experimental study. The resulting data indicated a trend towards a decrease in total pigment concentration for the first four sampling periods and a slight increase during the last sampling period. However, samples were collected only once per month for 5 months, and only two replicates were collected (in some cases no replicates) at each sampling time. In addition, there was only one sampling station within the dredged material disposal site.

91. Phytoplankton samples were collected during and after the

disposal of dredged material on 9 September 1975 and 9 October 1975. Two replicates were taken at the surface and near the bottom before and after disposal. The concentration of pigments was slightly lower after disposal on both dates. Samples were also collected at intervals following a second disposal operation on 9 October. The postdisposal concentration of pigments was lower than the predisposal concentration at 30 minutes and higher than that at 50 minutes in the surface samples. Only one sample was collected for each sampling interval during the postdisposal period.

92. The lack of sufficient sampling periods and replicates precluded any statistical analysis between sampling intervals. It is concluded that the phytoplankton data were insufficient to make any determinations on the impact of disposal of dredged material on phytoplankton communities.

Zooplankton

93. Replicate oblique plankton tows were obtained from one inshore station and from one offshore station during the pilot study. During the experimental study, replicate samples were obtained (on a monthly basis between 25 July and 24 November 1975) from a station within the disposal site and from a station within the entrance channel. Additionally, 24 samples were obtained from the National Marine Fisheries Service (NMFS) Archive collection for further analysis of temporal abundance of meroplankton populations and for a more detailed evaluation of reproductive patterns of the offshore macroinvertebrates and nekton. These samples were collected by the NMFS during the period 1 January 1963 to 31 December 1965 from an established sampling station in close proximity to the disposal site.

94. Pilot data were collected on 14 May 1975. Copepods comprised 82 percent of the total number of individuals at the inshore station and 90 percent at the offshore station. The Chaethognatha accounted for 11 percent of the holoplankton at the inshore station and 5.5 percent of the holoplankton at the offshore station. The meroplankton component accounted for only 3 to 5 percent of the total population.

95. During the experimental study, copepods comprised 36, 47, 84, and 70 percent of the total number of holoplankton individuals in the four reported samples. Three of the samples contained members of the Chaethognatha which, when added to the Copepoda, accounted for 85 to 97 percent of the holoplankton. The other sample contained 60 percent cladocerans. Hence, copepods, cladocerans, and/or Chaethognatha accounted for 85 to 98 percent of the holoplankton collected during the experimental study.

96. The total numbers of meroplankton were virtually unchanged throughout the experimental study period. Mollusk larvae were abundant in most collections. Crustacean larvae were most abundant in September and October.

97. Twenty-two of the 24 samples obtained from the NMFS Archive collection were dominated by members of the Copepoda; these comprised 54 to 99.9 percent of the total number of individuals of the holoplankton. Urochordates were the second most abundant group of animals in many of the samples and, together with the copepods, accounted for most of the animals present.

98. The larval forms of benthic invertebrates comprised most of the meroplankton (fish eggs and larvae were included in this category but were always a minor component). Barnacle nauplii and cypris larvae were abundant in some spring samples. However, because there were few hard substrates in the disposal site on which to settle, they were of minor importance in repopulating disrupted bottoms. The three important groups in the meroplankton were the young of polychaete worms, mollusks (principally snails and clams), and crustaceans (mostly various types of crabs and shrimp), which live on or burrow into the bottom. Polychaete larvae were most abundant in the spring of 1963 and 1965 and in the summer of 1964. The larval mollusk populations peaked in the summer of 1963, the spring and fall of 1964, and the spring of 1965. Mollusk larvae were present in large numbers compared to other meroplanktonic forms. Crustacean larvae were generally most abundant between May and October.

99. In general, the holoplanktonic species composition of samples collected during the present study was similar to that of the NMFS samples obtained during 1963-1965. Even the order of abundance among the more common species was quite similar between the two time periods. Because of the taxonomic difficulties involved in positive identification of meroplanktonic organisms below the phylum or class level, no definitive information was obtained on macroinvertebrate and nekton population reproductive patterns.

Meiobenthos

100. Meiobenthic samples were not collected during the pilot study. For reasons discussed in Appendix C, meiobenthic samples were collected only in July, September, and December 1975. These were subsamples of the macrobenthic samples. There were insufficient meiobenthic data to provide comparisons of trends between any of the sampled areas. The contractor did not present any data in Appendix C or attempt to draw any conclusions from the meiobenthic data because, in addition to the small number of samples, the variability between replicates was large.

Finfish and nektonic invertebrates

101. From a series of otter trawls during the pilot study, it was found that two species, the drum, Micropogon undulatus, and a portunid crab, Callinectes similis, were widespread and abundant throughout the study area. Other species, the anchovy, Anchoa mitchilli, cutlass fish, Trichiurus lepturus, sea robin, Prinotus rubio, brown shrimp, Penaeus aztecus, and short squid, Loliguncula brevis, were also widespread, though less abundant.

102. Of the remaining species, 10 were used to divide the study area into nearshore and offshore station groups which corresponded roughly to the macrobenthic invertebrate station groups. The inshore station group was characterized by the shrimp, Xiphopeneus kroyeri, blue crab, Callinectes sapidus, star drum, Stellifer lanceolatus, sea trout, Cynoscion arenarius, banded croaker, Larimus fasciatus, and spot, Leiostomus xanthurus.

103. The offshore station group was characterized by the tongue fish, Symphurus civitatus, white shrimp, Penaeus setiferus, and mantis

shrimp, *Squilla empusa*. The remaining species were either irregularly distributed or uncommon.

104. A number of trawl samples were also obtained during the post-disposal period. The benthic invertebrate numbers decreased with the onset of fall and remained low during the remainder of the study. No particular pattern was evident for the nektonic invertebrates. The numbers present varied erratically between disposal and reference areas and between stations within each area. Other than a somewhat general decrease in the fall, the finfish followed much the same general trend as the nektonic invertebrates; i.e., there was no consistent pattern of change.

105. Statistical analyses of trawl samples indicated that there were no significant differences within or between disposal and reference areas with regard to benthic macroinvertebrates, nektonic invertebrates, finfish, or total biomass.

106. During September 1975, comparative trawls were made in clear water and adjacent turbid water created by disposal. It was found that three species of fish (croaker, star drum, and sea catfish) and the sea bob were more abundant in turbid-water trawls. Likewise, a much greater biomass was obtained in the turbid water.

Stomach analyses

107. Stomach analyses were conducted on almost 6000 fish. Of these, 26 percent had empty stomachs and 40 percent had full stomachs. The condition of the other stomachs was not given by the contractor (Appendix C). As would be expected, most of the food items consisted of the more abundant animals in the general area.

Benthic macroinvertebrates (pilot study)

108. Two replicate samples were taken from each of the 28 grid squares of the disposal site (Figure 4) between 15 April and 3 May 1975. A hemichordate (*Balanoglossus* sp.) was the most abundant organism and accounted for 60 percent of the total organisms; it occurred at 15 of the 28 stations but was primarily found in the deeper (offshore) portion of the disposal site. Its abundance was more than an order of magnitude greater than the second most abundant animal, a phoronoid (*Phoronis architecta*).

109. Numerical analyses of the macrobenthic invertebrate data indicated that there were two major assemblages at the disposal site. The first of these was the inshore group. It was characterized by few, if any, Balanoglossus sp., high numbers of polychaete worms, and lesser dominants among nemerteans, crustaceans, and mollusks. It is of interest that the more uncommon organisms were frequently found in this group. The second assemblage was an offshore group which was dominated by Balanoglossus sp., with polychaete worms as the second most abundant organisms. Several other assemblage groups were tentatively identified, but their relationship with the two major groups was not clear.

110. Principal components analysis was used to determine which, if any, abiotic variables were primarily responsible for determining the relationship of the biotic assemblages. This approach indicated that sediment grain size was the most important factor.

111. Ten replicates were taken at three of the stations to ascertain how many samples were needed to obtain a reasonable estimate of the number of species present at a given location. It was found that at station 6 (sandy mud bottom) more than 10 samples would be required; at station 17 (sand bottom) 8 samples; and at station 21 (soft clay bottom) 6 or 7 samples (Figure 5).

112. The pilot study results can not be used in the determination of impacts on the macroinvertebrates resulting from the disposal of dredged material because: (a) the sieve size was different, (b) the samples were collected over a rather long time span, and (c) position location was extremely poor. Hence, it will not be further considered. Of more interest are the macrobenthic invertebrate results obtained during the experimental phase of the investigation. Most of the biological effort was concentrated on these organisms since it was felt that they would be the most likely to exhibit any effects resulting from disposal.

Benthic macroinvertebrates (experimental study--results)

113. The raw results of the macrobenthic samples are given in Appendix E' of Appendix C. By and large, the contractor's approach to the portrayal of results and subsequent analyses was limited to an

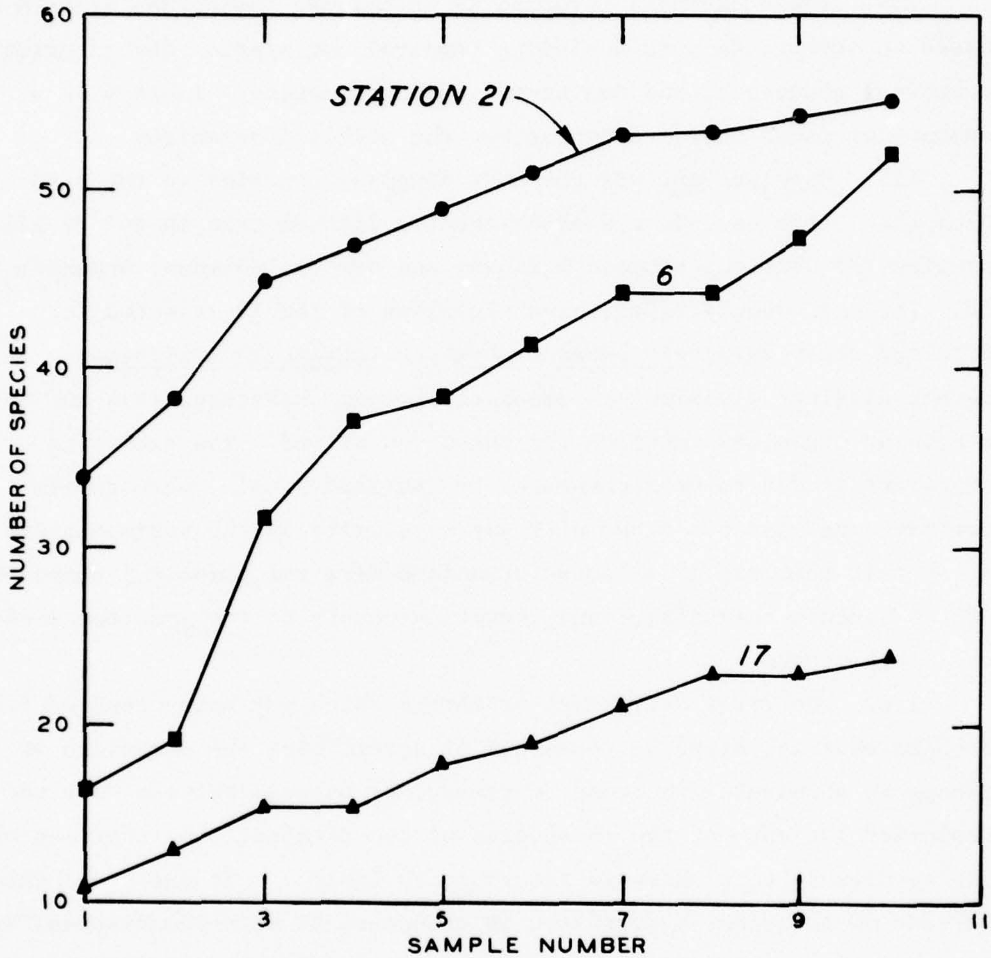

Figure 5. Plots of macroinvertebrate samples taken at three grid square stations during the pilot survey to determine the number of sample replicates required for estimating the number of species present

examination of the total number of individuals and total number of species at various areas and stations through time and to numerical analyses. Because this approach did not lead to defensible conclusions concerning the impact of dredged material disposal upon benthic macroinvertebrates, additional analyses were conducted.

114. These analyses involved 19 organisms. Selection of each was based on several factors including temporal and spatial distribution, numerical abundance, and dominance in the community. Table 6 is a summary of these characteristics for the selected organisms.

115. *Magelona sp.* was the most abundant organism in the study area (see Table 6). It was among the top fifteen taxa in 143 of 150 samples (25 stations sampled 6 times) and was the dominant organism in 58. The most poorly represented organisms of the 19 selected for detailed study were *Spiophanes bombyx* and *Vitrinella helicoides*. A rather distinct division was observed between these organisms and the remaining organisms found during the study period. The remaining organisms tended to be represented by few individuals, were rarely dominant, and did not occur with any regularity in the various areas. It is felt that the 19 selected organisms were the principal components of the benthic communities and, hence, probably of the greatest ecological significance.

116. The first estimation of change which may have resulted from dredged material disposal consisted of determining the direction of change in abundance (increase, decrease, no change) between July and September for each of the 19 species at the disposal and reference areas. The results of this analysis are given in Table 7. It was found that 68 percent of the species decreased in abundance at both the disposal and the reference areas. Thus, no acute impact could be demonstrated.

117. Changes in relative numerical abundance or dominance within benthic assemblages may also have resulted from dredged material disposal. Spearman's rank correlation procedure[18] was employed to evaluate such changes by using estimates of relative abundance of each of the 19 selected organisms at the stations thought most likely to be severely impacted by disposal. The buoyed stations (2-1, 12-3, and 14-3; see

Table 6

Characteristics of the 19 Organisms Selected for Detailed Analysis

Organism	Occurrence by Replicate*	Occurrence by Station Among 19 Most Dominant Taxa**	Occurrence by Station as Dominant Taxon†	No. of Organisms per m^2 Mean	No. of Organisms per m^2 Standard Deviation	Total Number of Organisms
Ampelisca abdita	171	60	1	17.6	41.6	7916
Balanoglossus sp.	111	41	11	45.1	232.0	20288
Cerebratulus lacteus	282	115	1	32.9	57.2	14794
Diopatra cuprea	302	111	5	35.0	53.1	15754
Glycera americana	111	32	0	8.5	21.9	3834
Glycinde solitaria	181	52	0	15.4	30.4	6944
Lumbrinereis impatiens	345	130	8	50.9	59.2	22912
Magelona spp.	395	143	58	154.6	172.5	69560
Mediomastus californiensis	251	98	14	78.6	177.9	35369
Nemertean, yellow-banded	202	66	0	16.1	25.3	7260
Nereis sp.	272	106	6	33.1	49.6	14906
Nereis succinea	113	39	1	12.4	34.7	5575
Ninoe nigripes	162	56	0	11.5	20.6	5184
Nuculana concentrica	162	59	1	18.2	41.7	8208
Prionospio pinnata	303	107	22	118.1	239.7	53240
Sigambra tentaculata	174	57	0	14.3	25.7	6416
Sigambra wassi	175	64	1	17.1	37.4	7678
Spiophanes bombyx	61	18	2	22.5	175.8	10132
Vitrinella helicoides	66	24	2	5.6	22.2	2512

Note: The total number of replicates was 450 (3 replicates per station × 5 stations per area × 5 areas × 6 sampling intervals = 450); the total number of station samples was 150 (5 stations per area × 5 areas × 6 sampling intervals = 150).

*The number of times that the organism was found among the 450 replicates.

**The number of times that the organism was found among the most dominant 19 taxa in the 150 station samples.

†The number of times that the organism was dominant in the 150 station samples.

Table 7

Direction of Change in Abundance of the 19 Selected Organisms Between July and September 1975

	Percent Change			
	Not Present	No Change	Increase	Decrease
Disposal areas 2, 12, and 14 (N = 57)*	18	2	12	68
Reference areas 15 and 27 (N = 38)*	18	5	9	68

Note: Both significant ($\alpha \leq 0.05$) and nonsignificant changes are included.

* N is the number of replicates for the disposal areas, 19 organisms × 3 areas = 57; for the reference areas, 19 organisms × 2 areas = 38.

Figure 4) in the disposal areas were used, and stations 15-3 and 27-3 from the reference areas were included for comparative purposes. Relative numerical abundance was estimated for each of the 19 organisms from each station for each sampling period by summing over replicates. The resulting estimates were then ranked in descending order, and coefficients of association were computed between sampling intervals at each station and between each disposal station and its assumed reference for each sampling interval. For the latter analyses, station 15-3 was assumed to be the reference for disposal station 2-1, and station 27-3 was assumed to be the reference for disposal stations 12-3 and 14-3. The results of these analyses are presented in Table 8. This analysis, however, does not evaluate direction of change or temporal extent of change for each of the selected organisms.

118. Hence, Duncan's multiple-range test[19] was employed to determine significant changes in the abundance of each selected organism through time and between areas and stations. The results of these analyses are given in Table 9 and, for reader convenience, in summary form in Table 10.

119. Significant changes were found to occur for all 19 organisms. These changes were randomly distributed over all stations. At disposal station 2-1, 37 percent of the possible* changes took place; at reference station 15-3, 47 percent of the possible changes were observed. The reference station (27-3) for stations 12-3 and 14-3 exhibited 32 percent of the possible change, while the disposal stations (12-3 and 14-3) showed 63 and 58 percent, respectively. This suggests that there was more change at the reference station (15-3) for disposal station 2-1 than there was at the disposal station itself. Conversely, disposal stations 12-3 and 14-3 had a greater degree of change than did their reference station (27-3).

120. However, these changes do not take into account the direction or magnitude of change. They merely indicate that a significant change

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* The maximum change at a station would occur if significant changes were observed in all 19 organisms throughout the study.

Table 8

Results of Correlation Analyses Between Selected Stations and Sampling Intervals Using Estimates of Relative Numerical Abundance of the 19 Selected Organisms

A. Comparisons between predisposal abundance and each postdisposal sampling period at reference stations.

1. Station 15-3:

	Sep	Dec	Jan	Apr	May
Spearman R	0.885	0.780	0.598	0.623	0.390
Level of significance	0.0001	0.001	0.001	0.004	0.10

2. Station 27-3:

	Sep	Dec	Jan	Apr	May
Spearman R	0.447	0.632	0.397	0.408	0.499
Level of significance	0.05	0.005	0.09	0.08	0.03

B. Comparisons of abundance over time at each disposal area buoyed station.

1. Station 2-1: Comparisons between July 1975* data and remaining sampling intervals:

	Sep	Dec	Jan	Apr	May
Spearman R	0.377	0.664	0.641	0.624	0.400
Level of significance	0.11	0.003	0.003	0.004	0.09

2. Station 12-3: Comparisons between predisposal data and each postdisposal sampling interval:

	Sep	Dec	Jan	Apr	May
Spearman R	-0.058	0.175	-0.165	-0.335	0.089
Level of significance	0.82	0.50	0.50	0.16	0.72

3. Station 14-3: Comparisons between predisposal data and each postdisposal sampling interval:

	Sep	Dec	Jan	Apr	May
Spearman R	0.517	0.370	0.225	0.080	0.082
Level of significance	0.03	0.20	0.36	0.75	0.74

(Continued)

* Corresponds to predisposal sampling interval at disposal area buoyed stations 12-3 and 14-3.

Table 8 (Concluded)

C. Comparisons of abundance between each disposal area buoyed station and its assumed reference station for each sampling interval.

1. Station 2-1 versus Station 15-3:

	Jul	Sep	Dec	Jan	Apr	May
Spearman R	0.614	0.639	0.838	0.497	0.606	0.381
Level of significance	0.01	0.005	0.001	0.05	0.01	0.20

2. Station 12-3 versus Station 27-3:

	Jul	Sep	Dec	Jan	Apr	May
Spearman R	0.612	0.267	0.555	0.251	-0.053	0.285
Level of significance	0.01	0.50	0.02	0.50	0.80	0.50

3. Station 14-3 versus Station 27-3:

	Jul	Sep	Dec	Jan	Apr	May
Spearman R	0.601	0.408	0.247	0.253	0.184	0.251
Level of significance	0.01	0.10	0.50	0.50	0.50	0.50

Table 9

Results of Duncan's Multiple-Range Test ($\alpha \leq 0.05$) for Selected Organisms; Analysis of Stations over Time

Organism	Station	Number of Organisms per m^2					
		Jul	Sep	Dec	Jan	Apr	May
Ampelisca abdita							
	12-3	27*	0	0	20*	48	21*
	14-3	59*	0	107	27	11	53*
	15-3	5	0	0	5	0	53
Balanoglossus sp.							
	12-3	59	0	0	0	0	32*
	14-3	5	0	101*	277	5	69*
Cerebratulus lacteus							
	15-3	5	0	11	32*	0	80
Diopatra cuprea							
	12-3	32	11	11	3	0	11
	14-3	53	0	16	0	5	0
Glycera americana							
	12-3	11*	5*	0	3*	32	11*
	15-3	0	0	5	0	5	69
Glycinde solitaria							
	2-1	0	16*	0	0	0	32
	12-3	32	0	0	0	0	16*
	14-3	32	0	0	0	0	27

(Continued)

Note: Only those stations with significant changes in abundance are included.
Numbers which are underlined are significantly different from those which are not underlined.
Numbers marked with an asterisk (*) are not significantly different from the extremes.

Table 9 (Continued)

Organism	Station	Number of Organisms per m^2					
		Jul	Sep	Dec	Jan	Apr	May
Lumbrinereis impatiens							
	2-1	0	16*	0	0	0	32
	12-3	32	0	0	0	0	16*
	14-3	32	0	0	0	16*	27
Magelona spp.							
	2-1	0	21	5	0	5	0
	14-3	160*	5	64*	144*	128*	224
	15-3	5	16*	48*	16*	21*	69
Mediomastus californiensis							
	2-1	27	11	347	0	16	112
	14-3	80	5	32*	48*	5	0
	15-3	107	37	677	107	315*	176
	27-3	75	5	11	5	11	0
Nemertean, yellow-banded							
	14-3	5	0	0	11	0	43
	27-3	11	0	0	0	0	0
Nereis sp.							
	2-1	155	5	64*	5	32*	37*
	12-3	11	16	80*	57*	91	53*
	15-3	5	5	21*	64*	75	5
Nereis succinea							
	2-1	5	48	117	11	0	5
	12-3	11	0	0	0	0	144
	15-3	11	0	59	0	0	16
Ninoe nigripes							
	12-3	21	0	0	0	0	0

(Continued)

Table 9 (Concluded)

Organism	Station	Number of Organisms per m^2 Jul	Sep	Dec	Jan	Apr	May
Nuculana concentrica							
	14-3	219*	0	0	0	5	37
	27-3	48*	5*	69	16*	5*	0
Prionospio pinnata							
	12-3	21	16	32*	13	75	16
	14-3	128	5	48*	21	11	75*
	15-3	288	208	715	128	192	11
	27-3	122	0	11	0	5	21
Sigambra tentaculata							
	14-3	69	0	16*	11	0	5
	15-3	16	21	80	0	11	5
	27-3	85	0	21	11	0	21
Sigambra wassi							
	12-3	64	0	0	10*	5*	37*
Spiophanes bombyx							
	2-1	5	0	0	37	21	144
	12-3	0	0	0	220	2064	16
Vitrinella helicoides							
	27-3	21*	0	32*	0	0	0

Table 10

Summary of Significant Station-Over-Time Changes in Abundance of Selected Organisms

Organism	Station	Change by Date
Ampelisca abdita		
	12-3	Apr > Sep and Dec
	14-3	Dec > Sep
	15-3	May > all other dates
Balanoglossus sp.		
	12-3	Jul > Sep, Dec, Jan, and Apr
	14-3	Jan > Jul, Sep, and Apr
Cerebratulus lacteus		
	15-3	May > Jul, Sep, Dec, and Apr
Diopatra cuprea		
	12-3	Jul > all other dates
	14-3	Jul > all other dates
Glycera americana		
	12-3	Apr > Dec
	15-3	May > all other dates
Glycinde solitaria		
	2-1	May > Jul, Dec, Jan, and Apr
	12-3	Jul > Sep, Dec, Jan, and Apr
	14-3	Jul and May > Sep, Dec, and Jan
Lumbrinereis impatiens		
	2-1	Sep > all other dates
	14-3	May > Sep
	15-3	May > Jul

(Continued)

Note: Only significant ($\alpha \leq 0.05$) changes are included here. For actual numbers of organisms per square metre, see Table 9.

Table 10 (Continued)

Organism	Station	Change by Date
Magelona spp.		
	2-1	Dec > all other dates
	14-3	Jul > all other dates
Mediomastus californiensis		
	2-1	Dec > all other dates
	14-3	Jul > Sep, Apr, and May
	15-3	Dec > Jul, Jan, Sep, and May
	27-3	Jul > all other dates
Nemertean, yellow-banded		
	14-3	May > all other dates
	27-3	Jul > all other dates
Nereis sp.		
	2-1	Jul > Sep and Jan
	12-1	Apr > Jul and Sep
	15-3	Apr > Jul, Sep, and May
Nereis succinea		
	2-1	Dec > all other dates
	12-3	May > all other dates
	15-3	Dec > all other dates
Ninoe nigripes		
	12-3	Jul > all other dates
Nuculana concentrica		
	14-3	Jul > all other dates
	27-3	May > Dec
Prinospio pinnata		
	12-3	Apr > Jul, Sep, Jan, and May
	14-3	Jul > Sep, Jan, and Apr
	15-3	Dec > all other dates
	27-3	Jul > all other dates

(Continued)

Table 10 (Concluded)

Organism	Station	Change by Date
Sigambra tentaculata		
	14-3	Jul > Sep, Jan, Apr, and May
	15-3	Dec > all other dates
	27-3	Jul > all other dates
Sigambra wassi		
	12-3	Jul > Sep and Dec
Spiophanes bombyx		
	2-1	May > all other dates
	12-3	Apr > all other dates
Vitrinella helicoides		
	27-3	Dec > Sep, Jan, Apr, and May

in abundance was noted for a particular organism during two or more sampling periods within the time frame of the study. As an example, it was found (Table 9) that Ampelisca abdita was more abundant in April 1976 at station 12-3 than in September 1975 or December 1975; it was more abundant in December 1975 at station 14-3 than in September 1975; finally, it was more abundant at station 15-3 in May 1976 than at any other time at that station. There were no significant changes in its abundance at stations 2-1 (in a disposal area) or 27-3 (in a reference area).

121. To facilitate comparisons of this nature, Table 10 was prepared. It consists of significant changes and the direction of change. It should be kept in mind that, for a given organism, five stations were evaluated (2-1, 12-3, 14-3, 15-3, and 27-3). Six sampling periods were included, and a significantly different abundance could have been noted in each. Alternately, there might not have been any differences between the six. Significant differences occurred as a result of presence/absence phenomena in many cases, and this probably has little ecological significance. An example is provided by Ninoe nigripes (Table 9): 21 animals/m^2 were recorded in July 1975. This was a significant difference from the other sampling periods because no organisms were observed at that station at other times. Thus, sampling error and/or seasonal variation was probably responsible for the observed difference rather than the disposal of dredged material.

122. Duncan's multiple-range test was also employed to determine differences between areas and sampling times. Areas and dates were initially compared for the entire study period. When significant area/date interactions were observed, an areas-within-dates and dates-within-areas comparison was utilized. The results of these analyses are given in Table 11.

123. Differences among all comparisons were not common. As with the impacted station comparisons, Table 11 portrays significant differences. There seems to be no consistent pattern which can be related to dredged material disposal.

Table 11

Results of Duncan's Multiple-Range Test ($\alpha \leq 0.05$) for Selected Organisms;

Analysis of Areas-Within-Dates and Dates-Within-Areas

		Number of Organisms per m^2												
		Areas-Within-Dates					Dates-Within-Areas							
Organism	Date	Area 2	Area 12	Area 14	Area 15	Area 27	Area	Jul	Sep	Dec	Jan	Apr	May
Ampelisca abdita	All	7	18	42	10	10							
Cerebratulus lacteus							All	37*	26	46	23	22	41*
Diopatra cuprea							All	67	33	37	30*	30*	12
Glycera americana	May	43	28	23	51	5	2	6	2	1	3	23	43
							12	2	2	2	1	16*	28
							14	4	1	1	3	10*	23
							15	2	1	1	0	10	51
Glycinde solitaria	Apr	27*	11	12	39	8	2	11	11	5	10	27	85
	May	85	28	18	34	23	12	22*	2*	0	3*	14*	28
Lumbrinereis impatiens	All	35	57	89	30	44	All	44*	28	51	52	53	79
Magelona spp.	Jul	153*	58	47	288	106	2	152*	22	199	385	28	85*
	Dec	189	9	19	278	10	15	288	50	276	65	70	330
Mediomastus californiensis	All	145	27	18	180	22	All	130	24	103	100	27	88*

(Continued)

Note: Only those areas and dates with significant changes in abundance are included.
Numbers with no underline, a single underline, or double underline are significantly different.
Numbers marked with an asterisk (*) are not significantly different.

Table 11 (Continued)

Organism	Date	Areas-Within-Dates: Area 2	Area 12	Area 14	Area 15	Area 27	Dates-Within-Areas: Area	Jul	Sep	Dec	Jan	Apr	May
Nemertean, yellow-banded	Jul	23*	28	10	22*	8	2	23	9	16	51	22	50
	Dec	16*	7*	16*	22	3	12	28	7	7	9	15*	26
	Jan	51	9	6	11	1	14	10	5	16	6	0	32
	Apr	22	15*	0	25	1	14	22*	7	22*	11*	25*	50
	May	50	26*	32*	47*	1							
Nereis sp.	All	34*	46	17	53	17							
Nereis succinea	All	13*	15*	15*	18	1							
Ninoe nigripes	Jul	2	16	51	2	4*	14	51	18	17	27	25	15
	Sep	7*	21	18*	10*	1							
	Jan	3	18*	27	2	9*							
	Apr	1	20*	25	8*	12*							
	May	2*	12*	15	0	7*							
Nuculana concentrica	Jul	4	39	118	0	48	12	39	18*	36*	21*	10*	1
	Dec	13	36*	32*	16	53	14	118	25	32	15	3	19
							27	48*	17*	52	28*	5	1
Prionospio pinnata	Jul	179	63	61	458	124	2	179*	44	442	322*	165*	205*
	Dec	442	32	36	440	13	15	458	118*	440	283*	219*	43

(Continued)

Table 11 (Concluded)

		Number of Organisms per m^2												
		Areas-Within-Dates					Dates-Within-Areas							
Organism	Date	Area 2	Area 12	Area 14	Area 15	Area 27	Area	Jul	Sep	Dec	Jan	Apr	May
Prionospio pinnata (Cont'd)	Jan	322	71	12	283	3							
	Apr	165*	26	19	219	5							
Sigambra tentaculata	Jul	4	9	30	25*	74	2	4	0	7	16*	3	30
	Dec	7	15	6	45	17	14	30	10	6	3	3	5
	May	30	13*	5	9	22*	15	25	7	45	13	17	9
							27	74	2	17	12	16	22
Vitrinella helicoides	Dec	2	0	4*	20	48	15	0	0	20	0	0	1
	Jan	1	6*	0	6*	22	27	11*	11*	48	22	0	0

124. Areas-within-dates and dates-within-areas differences occurred for many of the organisms. A summary of significant differences and the direction of change is given in Table 12. As with the overall changes, there is little commonality in the observed differences.

Benthic macroinvertebrates (experimental study--discussion)

125. There were a number of approaches which were followed in attempting to evaluate the impact of dredged material disposal upon aquatic organisms. As noted in the results section above, little useful data were obtained except for benthic macroinvertebrates. Several hypotheses were developed, and it is important to understand the rationale behind each and the limitation that each has.

126. First, disposal may have an immediate effect on the community. This may be reflected in increases or decreases in the number of organisms and/or changes in community composition. Such changes can be evaluated only if there are baseline (predisposal) data available. In addition, reference areas are also required so that changes at a disposal area can be distinguished from those caused by natural events rather than disposal.

127. In this investigation, there were no baseline data for area 2. Moreover, disposal in this area took place on three separate occasions, so this area, at best, represents a chronically impacted area. It is assumed that area 15 was a suitable reference area for area 2.

128. Predisposal data are available for areas 12 and 14, and area 27 was assumed to be a reference area for these two disposal areas. An examination of the grain-size data for area 27 indicates that this assumption may not be correct because the substrate at area 27 was quite different from that at areas 12 and 14.

129. There may also be a delayed effect from disposal. It is assumed that such an effect would be demonstrated by differences in the number and type of organisms between the disposal and reference areas weeks (perhaps months) after disposal. If the reference area is not comparable to the disposal area, there is no basis for evaluating delayed or long-term effects.

Table 12

Summary of Significant Areas-Within-Dates and Dates-Within-Areas Changes in Abundance of Selected Organisms

Organism	Areas-Within-Dates: Date	Areas-Within-Dates: Change in Areas	Dates-Within-Areas: Area	Dates-Within-Areas: Change in Dates
Ampelisca abdita	All	14 > all other areas		
Cerebratulus lacteus			All	Dec > Sep, Jan, and Apr
Diopatra cuprea			All	Jul > Sep and Dec > May
Glycera americana	May	2 and 15 > 12 and 14 > 27	2	May > Apr > Jul, Sep, Dec, and Jan
			12	May > Jul, Sep, Dec, and Jan
			14	May > Jul, Sep, Dec, and Jan
			15	May > Jul, Sep, Dec, and Jan
Glycinde solitaria	Apr	15 > 12, 14, and 27	2	May > all other dates
	May	2 > all other areas	12	May > Dec
Lumbrinereis impatiens	All	14 > all other areas	All	May > Sep > Dec, Jan, and Apr
Magelona spp.	Jul	15 > 12, 14, and 27	2	Jan > Dec > Sep and Apr
	Dec	2 and 15 > 12, 14, and 27	15	Jul, Dec, and May > Sep, Jan, and Apr
	Jan	2 > all other areas		
Mediomastus californiensis	All	2 and 15 > 12, 14, and 27	All	Jul, Dec, and Jan > Sep and Apr
Nemertean, yellow-banded	Jul	12 > 14 and 27	2	Jan and May > all other dates
	Dec	15 > 27	12	Jul and May > Sep, Dec, and Jan
	Jan	2 > all other areas	14	May > all other dates
	Apr	2 and 15 > 14 and 27	15	May > Sep
	May	2 > 27		

(Continued)

Note: Only significant ($\alpha \leq 0.05$) changes are included here. For actual numbers of organisms per square metre, see Table 11.

Table 12 (Concluded)

Organism	Areas-Within-Dates		Dates-Within-Areas	
	Date	Change in Areas	Area	Change in Dates
<u>Nereis</u> sp.	All	12 and 15 > 14 and 27		
<u>Nereis succinea</u>	All	15 > 27		
<u>Ninoe nigripes</u>	Jul	14 > 12 > 2 and 15	14	Jul > all other dates
	Sep	12 > 27		
	Jan	27 > 2 and 15		
	Apr	14 > 2		
	May	14 > 15		
<u>Nuculana concentrica</u>	Jul	14 > 12 > 27 > 2 and 15	12	Jul > May
	Dec	27 > 2 and 15	14	Jul > all other dates
			27	Dec > Apr and May
<u>Prionospio pinnata</u>	Jul	15 > all other areas	2	Dec > Sep
	Dec	2 and 15 > 12, 14, and 27	15	Jul and Dec > May
	Jan	2 and 15 > 12, 14, and 27		
	Apr	15 > 12, 14, and 27		
<u>Sigambra tentaculata</u>	Jul	27 > 14 > 2 and 12	2	May > Jul, Sep, Dec, and Apr
	Dec	15 > all other areas	14	Jul > all other dates
	May	2 > 14 and 15	15	Dec > all other dates
			27	Jul > all other dates
<u>Vitrinella helicoides</u>	Dec	27 > 15 > 2 and 12	15	Dec > all other dates
	Jan	27 > 2 and 14	27	Jan > Dec > Apr and May

130. Several other requirements must be met if a realistic evaluation of disposal impacts is to be made. The most important of these is an assurance that samples which have been impacted by disposal can be separated from those which have not. It was not possible to utilize physical or chemical measurements in such a way as to be able to characterize a sample; this led to three hypotheses and each required a slightly different treatment of the data.

131. The biological investigator attempted (through visual observations) to characterize each station with regard to the presence or absence of dredged material. This appears not to be a valid procedure because it is subjective and apparently resulted in dredged material appearing and disappearing in a sporadic fashion at various stations through time. As an example, some samples were described as having dredged material prior to disposal, but, in area 14, the initial post-disposal samples appeared not to contain dredged material. Table 13 presents a summary of the presence or absence of dredged material at areas 2, 12, and 14 as determined by visual examination.

132. Disposal was concentrated in the vicinity of a buoy in each disposal area. Hence, station 2-1 should have had dredged material present for all sampling intervals as should stations 12-3 and 14-3 from September through May. This was not the case, however, since no dredged material was evident at station 14-3 in the immediate postdisposal period or at any station in area 2 in December and May.

133. These irregularities can be partially explained by the inability of the contractor to return to a given station (other than the three with buoys). Navigation was by dead reckoning, and a fathometer was not used to determine bottom irregularities which may have represented dredged material.

134. A cursory attempt was made to compare stations with dredged material within an area to those which did not exhibit dredged material. In essence, this established reference and disposal stations within a disposal area. This comparison led to no conclusions concerning disposal because of the erratic temporal and spatial distribution of stations having dredged material.

Table 13

Presence and Absence of Dredged Material in Areas 2, 12, and 14

Station	Jul	Sep	Dec	Jan	Apr	May
2-1	+	+	-	+	+	-
2-2	-	-	-	-	+	-
2-3	-	-	-	-	-	-
2-4	-	-	-	-	-	-
2-5	+	+	-	+	+	-
12-1	+	-	-	+	-	-
12-2	-	-	-	+	-	-
12-3	-	+	+	+	+	+
12-4	-	-	-	-	-	-
12-5	-	+	-	-	-	+
14-1	-	-	-	+	-	+
14-2	-	-	-	+	-	-
14-3	-	-	+	+	+	+
14-4	-	-	-	-	+	-
14-5	-	-	-	-	+	-

Note: Plus (+) sign denotes presence; minus (-) sign denotes absence. Determination was made by visual examination (Appendix C).

135. Since the visual determination approach was rejected as invalid, several other hypotheses were proposed. The first of these assumed that immediate impact would be demonstrated by differential population changes between the disposal areas and the reference areas. Upon investigation, it was found that the reference and disposal area populations behaved in an essentially identical fashion. The 68 percent decrease in the 19 selected organisms observed in the disposal areas was matched by a 68 percent decrease in the reference areas. This probably represents a seasonal decline and can in no way be attributed to the disposal of dredged material.

136. The second hypothesis assumed that disposal would result in changes in dominance through time. Correlation analysis was employed to test for general trends in relative numerical dominance of the 19 selected organisms between predisposal and postdisposal conditions at each disposal station. The resulting trends were then analyzed in terms of general trends found to occur (between predisposal and postdisposal sampling intervals) at each reference station and between each disposal station and its assumed reference station for each sampling interval.

137. An initial analysis of reference station data (Table 8) indicated a significant ($\alpha \leq 0.10$) positive association in relative numerical abundance of the 19 organisms over time for both reference stations. Thus, based on these results, although temporal changes in abundance may have occurred for one or more of the selected organisms over one or more sampling intervals, there were no apparent major shifts in relative numerical abundance at either reference station during the study.

138. The remaining analyses involved tests of association between predisposal and postdisposal data obtained at each disposal station, and between each disposal station and its assumed reference station for each sampling interval. A discussion of these results is presented below.

139. Station 2-1. During the pilot study, this station was identified as being previously impacted by dredged material. The degree of impact was not known, and no background data were available to

determine baseline or predisposal conditions at the station.

140. The station was established as representative of an area subjected to frequent dredged material disposal. Although a variety of dredged sediments, ranging from silts and clays to sands and shell hash, were deposited at the station, sediment analyses indicated a predominant sand and shell hash substrate each time samples were obtained.

141. Comparisons between sampling intervals at this station indicated a high degree of positive association in the dominance of the 19 selected organisms over time. This trend was similarly observed at both established reference stations over time. Additionally, there was a high degree of positive association between this station and its assumed reference station (15-3) for each sampling period.

142. Based on these analyses, it appears that, although untested temporal changes in abundance may have occurred for one or more of the 19 selected organisms over one or more sampling intervals, there were no apparent major shifts in relative numerical abundance at this station during the study period. This trend was apparently maintained even though the station received substantial quantities of dredged material on three separate occasions.

143. Station 12-3. Predisposal sediment samples obtained from this station were characterized as predominantly silts and clays. Postdisposal sediment analyses indicated a shift to a predominantly sand and shell hash substrate for each time interval when samples were obtained (Appendix C).

144. Analyses of trends at this station over time indicated a general lack of association between predisposal data and data obtained for each of the five postdisposal sampling intervals. Of additional interest was the fact that three of the five postdisposal sampling intervals showed a negative association when compared to predisposal conditions.

145. Station 12-3 was then compared to its assumed reference station (27-3) for each sampling interval. Significant ($\alpha \leq 0.10$) positive associations were found between the two stations for the predisposal (July) samples and again for the December (postdisposal) samples.

However, the remainder of the postdisposal comparisons indicated a general lack of association between the two stations.

146. Overall trends in these analyses indicate that a shift in relative numerical abundance of the 19 selected organisms may have occurred at this station after dredged material disposal.

147. Station 14-3. Predisposal sediment samples obtained at this station were characterized as predominantly silts and clays. Postdisposal sediment analyses indicated a substantial increase in shell hash and Beaumont clay (Appendix C).

148. An analysis of trends in dominance at this station indicated a general lack of association between predisposal conditions and all postdisposal sampling intervals except for the immediate postdisposal period (September). This sampling period exhibited a significant positive association with predisposal conditions.

149. Comparisons of association between this station and its assumed reference station (27-3) exhibited similar trends. Both the predisposal and immediate postdisposal sample comparisons exhibited a high degree of positive association; however, the remainder of postdisposal comparisons indicated a general lack of association between the two stations.

150. Overall trends in these analyses indicate that a shift in dominance may have occurred at this station after dredged material disposal. The apparent anomaly for the immediate postdisposal period was probably due to error in station location at station 14-3 for this sampling period. This assumption is supported by the contractor's statement (Appendix C) that dredged sediments were visibly evident at this station in all postdisposal samples except during the immediate postdisposal period.

151. The results of these analyses indicated that shifts in dominance of the 19 selected organisms may have occurred at stations 12-3 and 14-3 after dredged material disposal.

152. The remaining hypotheses involved the use of Duncan's multiple-range test to examine the response of individual species to disposal. Disposal was thought to be greatest near the buoyed stations;

stations 2-1, 12-3, and 14-3 were compared to 15-3 and 27-3 (the latter are designated as reference stations). Alternately, it was hypothesized that all stations in a disposal area were impacted, and the disposal areas were compared to the reference areas. An interpretation of these analyses is given below on an organism-by-organism basis. Only significant differences are considered.

153. It should be kept in mind that disposal occurred at area 2 in May and September 1975 and February 1976. Therefore, samples taken in July, September, and March are considered to be immediate postdisposal. At areas 12 and 14, only the September samples are immediate postdisposal.

154. Ampelisca abdita. At station 12-3, the April abundance was greater than that for September and December, while, at station 14-3, the December abundance was greater than the September. Throughout the study period, its abundance at area 14 was greater than at the other areas. At station 15-3, it was most abundant in May. The lack of agreement between the time of maximum abundance at stations 12-3 and 14-3 and the fact that it was more abundant in area 14 than in any other area suggests that disposal did not have an impact on this organism.

155. Balanoglossus sp. The only significant changes in the abundance of this animal occurred at stations 12-3 and 14-3. At the former, it was more abundant in July than in September, December, January, and April, while, at the latter in January, its abundance was greater than in July, September, and April. Again, this suggests that no impact occurred because the abundance patterns at the two areas are quite different.

156. Cerebratulus lacteus. At station 15-3 the abundance in May was greater than that in July, September, December, and April. When all areas were compared, it was found that its abundance in December was greater than in September, January, and April. Although it is possible that the abundance pattern observed at station 15-3 but not at station 2-1 resulted from periodic disposal at the latter station, the lack of any differences at station 27-3 makes this effect unlikely. Although the overall comparison indicates a peak of abundance in December, changes in abundance were not great enough to result in significant differences other than at station 15-3.

157. Diopatra cuprea. The abundance of this animal was greater in July at stations 12-3 and 14-3 than during the other months. Although this might suggest that disposal reduced the population and that recovery did not occur, it is observed that overall July abundance was greater than September and December; the latter months had significantly greater populations than May. This indicates that Diopatra cuprea is quite seasonal, with a population peak in late summer and a decline throughout fall, winter, and spring.

158. Glycera americana. Stations 12-3 and 15-3 exhibited a peak of abundance in April and May, respectively. However, at station 12-3, the abundance in April was different only from December, while, at station 15-3, the abundance in May was greater than for the other five sampling periods. When areas-within-dates were compared, it was found that in May the abundance in areas 2 and 15 was greater than that in areas 12 and 14. The latter two, in turn, had a greater abundance than area 27. This suggests that this animal was not impacted at area 2, because its abundance is comparable with that at area 15, and that area 27 does not adequately serve as a reference area.

159. When dates-within-areas were compared, a very strong pattern of seasonality appeared, with no changes occurring in the populations at areas 2, 12, 14, and 15 until late sping when a definite increase occurred. It is concluded that Glycera americana was not impacted by the disposal of dredged material.

160. Glycinde solitaria. This animal appears to have been influenced by the disposal of dredged material. A peak of abundance was noted at station 14-3 in July and May and at station 12-3 in July. At station 2-1, the May abundance was different than that seen in July, December, January, and April. A similar pattern is seen for April and May. Areas 2 (May) and 15 (April) had greater populations that the other areas. Likewise, in the dates-within-areas comparisons, population peaks were observed at areas 2 and 12 in May.

161. These abundance patterns are interpreted as evidence that continued disposal reduced the population at station 2-1 and, in general, throughout area 2, with some recovery occurring in late spring.

Similarly, the animal was virtually eliminated from stations 12-3 and 14-3 after disposal but recovered in late spring at both stations. There is a small possibility that seasonality was responsible, but this seems unlikely as there was no evidence for it at either of the reference areas.

162. Lumbrinereis impatiens. This organism was not abundant at station 2-1 in September and at stations 15-3 and 14-3 in May. Overall, its abundance was greatest in area 14 and there was a peak in May and a low in September when all areas were considered. The lack of consistency in abundance at disposal stations versus reference stations and at disposal areas versus reference areas indicates that disposal did not appreciably change the abundance of this organism.

163. Magelona spp. This group of organisms was the most abundant and dominant in the study area. As such, it may be considered as a "weed" species; i.e., one which can tolerate a wide variety of conditions and habitats. Significant changes in abundance were noted at stations 2-1 and 14-3, with a peak being present in December and July, respectively. When all stations were considered, July and December exhibited abundances greater than the other sampling periods. When areas-within-dates were compared, the abundance in area 15 was greater than in areas 12, 14, and 27 in July; in areas 2 and 15, than in areas 12, 14, and 27 in December; and in area 2, than in areas 12, 14, 15 and 27 in January. For dates-within-areas, the abundance at area 2 was greatest in January. This, in turn, was different from December, and December was greater than September and April. In area 15, the abundance in July, December, and May was greater than in September, January and April.

164. It can be seen that this group of organisms was most common in areas 2 and 15 and that a bimodal pattern of peak abundance (summer and winter) occurred at both areas. This suggests that they were not particularly sensitive to dredged material disposal. It is conceivable that individual species within the genus were affected by disposal, but, if this did occur, it is obscured by the treatment of some unknown number of species (each of which may have had a different response) as a collective entity.

166. Mediomastus californiensis. Significant differences in the abundance of this organism were observed at stations 2-1 and 15-3. With the exception of April at station 15-3, a peak occurred in December at each station. A July peak was observed at stations 14-3 and 27-3. The similarity in abundance patterns between the disposal and reference stations suggests that disposal had little, if any, impact at the primary disposal stations.

166. When areas-within-dates were considered, it was found that the abundances at areas 2 and 15 were comparable over the entire study period. For dates-within-areas, a population low was observed to occur at all stations in September and April. As with Magelona spp., this bimodality appears to be independent of any influence from dredged material disposal.

167. Nemertean, yellow-banded. Stations 14-3 and 27-3 had a peak of abundance of this organism in May and June, respectively. During the entire period, it was present at these stations only in June and December. Great variation was seen when areas-within-dates comparisons were made. In July, it was most abundant at area 12; in December, at area 15; in January, at area 12; in April, at areas 2 and 15; and in May, at area 2. It was rarely observed at area 27, and, in July, December, January, April, and May, its abundance at area 27 was significantly lower than that at most of the other areas. In the dates-within-areas comparisons, January and May abundances were different from the other sampling period at area 2; July and May, at area 12; and July, at area 14. In area 15, May was different only from September.

168. These differences in abundance at various times and in various areas are impossible to reconcile with disposal activity. Reference area 15 behaved much the same as disposal area 2, while reference area 27 appeared to be an unsuitable habitat for this animal. If disposal had any impact at all, it cannot be ascertained from the available data.

169. Nereis sp. At station 2-1 this animal reached a peak of abundance in July (immediate postdisposal), while its peak of abundance at stations 12-3 and 15-3 occurred in April. Throughout the study

period, it was more abundant in areas 12 and 15 than in 14 or 27. There is no evidence for an effect of disposal because of the changes in the disposal areas relative to the reference areas.

170. Nereis succinea. A peak of abundance was observed at stations 2-1 and 15-3 in December and at 12-3 in May. At other times, it was quite rare at these stations and in area 27. In the areas-within-dates comparison, areas 15 and 27 were different throughout the study period, with this organism being most abundant at area 15 and least abundant at area 27. The other areas exhibited intermediate abundances. Because of the similarity of abundance at stations 2-1 and 15-3 and the lack of any change at area 14 or station 14-3, it is concluded that disposal of dredged material did not affect N. succinea.

171. Ninoe nigripes. The only significant change at any of the stations occurred at 12-3 in July; the animal was absent from 12-3 during the remainder of the study. In comparison of areas-within-dates, it was most abundant at area 14 in July, January, and May and at area 12 in September. Throughout the study period, it was most abundant in area 14 in July.

172. The animal appears to have had a definite affinity with area 14 and, to a lesser extent, area 12 since it was more abundant there than elsewhere. This relationship is further supported by the general coincidence of peaks of abundance at these two areas. If this is an impact of disposal, an increase, rather than a decrease, was the observed response; however, it should be kept in mind that the organism disappeared at station 12-3 after disposal.

173. Nuculana concentrica. As with Ninoe nigripes, this animal exhibited significant changes in abundance primarily in areas 12, 14, and 27. It was most abundant at 14-3 in July and at 27 in December. It was virtually absent from the former station after July. This may represent an impact of disposal although no changes were observed at station 2-1 or 12-3. The abundance at area 14 was significantly greater than at the other areas in July and was significantly lower at areas 2 and 15. In December, area 27 had a greater population than areas 2 and 15. In dates-within-areas comparisons, a peak of abundance occurred at areas 12 and 14 in July and at area 27 in December.

174. Although the peak of abundance occurred at areas 12 and 14 in July and at area 27 in December, it is possible that disposal adversely affected this organism in areas 12 and 14. However, there is evidence of a seasonal effect in that the animals were least abundant in April and May at both disposal areas and the reference area. This seasonal effect may also have been responsible for the observed distributional patterns.

175. Prionospio pinnata. A population peak for this organism was observed at station 12-3 in April, at 14-3 and 27-3 in July, and at 15-3 in December. In the comparison of areas-within-dates, the greatest abundance was at area 15 in July, at areas 2 and 15 in December and January, and at area 15 in April. The only significant changes in the comparison of dates-within-areas were the abundance peak at area 2 in December and the two peaks (July and December) at area 15.

176. As areas 2 and 15 behaved in almost precisely the same manner, there is no evidence for an effect of disposal at area 2. The abundance patterns at areas 12 and 14 were different from that at area 27; however, there was so much difference between areas 12 and 14 that it is difficult to tell whether or not there may have been an impact from disposal.

177. Sigambra tentaculata. This organism exhibited a peak of abundance at stations 14-3 and 27-3 in July and at 15-3 in December. No differences were observed at stations 2-1 or 12-3. It was most abundant in area 2 in May, area 15 in December, area 14 in July, and area 27 in July. It does not appear to have been affected by disposal at area 14 but may have been at area 2 since the peak of abundance at area 2 took place in May rather than in December as at the reference area (area 15).

178. Sigambra wassi. The only change in abundance shown by this animal was a population peak at station 12-3 in July. There were no other changes or interactions between the various stations, areas, and dates. There is no evidence of an impact of disposal.

179. Spiophanes bombyx. Only two differences were observed in the abundance of this organism. There was a population peak at station

2-1 in May and at 12-3 in April. This may reflect an effect of disposal. If so, the effect appears to have been a change of conditions which operated to make the animal uncommonly abundant at these two stations in late spring.

180. Vitrinella helicoides. Changes in abundance for this organism primarily took place at station 27-3 and in area 27 and, to a lesser degree, in area 15. A mid-winter peak of abundance was observed in December at station 27-3 and in December and January in area 27. A peak was also noted at area 15 in December.

181. This indicates that disposal may have had an impact on this animal because the population peaks common to both reference areas did not take place in the disposal areas. It should be noted that the organism was not very common in any of the areas, and this fact increases the probability of significant differences occurring as a result of sampling error.

Summary

182. In general, the Galveston ADFI failed to demonstrate any major impacts associated with disposal. This finding should not be taken as an indication that none occurred. Rather, it is a reflection of the available data, their interpretation, and the validity of a number of assumptions. There are no means to test the assumptions, and, if they are incorrect, the interpretation is probably incorrect.

183. The extreme variability of the numbers of organisms present indicates that a large number of samples are required in order to adequately compare stations and areas. In some instances for the number of samples required for the standard error to equal 20 percent of the mean, over 1000 samples would have had to be taken. Thus, variability not compensated for by an adequate sample size may have obscured some impacts and indicated changes when none occurred.

184. The fact that almost all of the organisms selected for detailed analyses underwent essentially identical changes in abundance when the predisposal values were compared to the immediate postdisposal

values indicates that there was no immediate impact of disposal. There is some evidence (in a few instances) for an impact at some later point in time. It is difficult, however, to separate such a delayed impact from changes which occurred as a result of natural seasonal abundance. Both reference areas were downdrift from the disposal areas, and area 27 had a substrate unlike that of disposal areas 12 and 14.

185. Analyses are further complicated by the matter of position location. In attempting to compare physical characteristics of the substrate (such as grain size) or organisms at the same station through time, gross inconsistencies were noted even in the reference areas. This may result from large variations in substrate over a short distance or from position error. It is quite possible that both factors were responsible.

186. There is no way to be sure whether or not a given sample contained dredged material. This led to the two major assumptions necessary to analyze the data. It is more reasonable to assume that buoyed stations (2-1, 12-3, and 14-3) always had dredged material present after disposal (although this was not confirmed by visual examination of the sediment) than to assume that all five stations within a disposal area were equally impacted. Hence, if these assumptions are grossly incorrect, no definitive statement can be made concerning the impact of dredged material disposal upon benthic communities.

PART VI: CONCLUSIONS

Physical Studies

187. Disposal of dredged material resulted in the formation of distinct mounds at the disposal site. These mounds were gradually eroded, with the most rapid change occurring in shallow water (area 2) and the slowest change in deep water (area 14).

188. Transport of dredged material appeared to be predominantly to the southwest and thus away from the Galveston Bay Channel.

189. It was not possible to distinguish dredged material from natural sediments, except when occasional lumps of Beaumont clay were present. There was limited evidence that some sorting was occurring, primarily consisting of the removal of the finer fraction.

Chemical Studies

190. Disposal operations at the disposal site resulted in no apparent major alterations in the total concentrations of sediment chemical parameters measured during this investigation.

191. Disposal of dredged material at the disposal site exerted no apparent long-term effects on heavy metals, nutrient, or dissolved oxygen concentrations in the disposal area waters.

192. During disposal operations, no Fe, Cu, As, Cd, Ni, Hg, Pb, or Zn water column concentrations were found that would pose any potential hazard for marine life.

193. Manganese concentrations increased in the disposal site water column during seven of the nine disposal operations monitored. The magnitude (less than 200 g/ℓ) and duration (less than 35 minutes) increases were such that no harm would result to aquatic organisms.

194. Ammonium-N concentrations reached levels where un-ionized ammonia concentrations could have potentially harmed aquatic organisms in the disposal site water column only during the second Texas City disposal operation. However, the ammonium-N concentrations increased

only in bottom waters and exceeded chronic water quality criteria at the sampling point for only 12 minutes. Exposure to moderate concentrations of un-ionized ammonia (0.025 to 0.06 mg/ℓ) greater than the chronic exposure level of 0.02 mg/ℓ for such a short period of time should not pose any problems for nonmotile organisms that the plume passes over or for nektonic organisms that might swim through the plume.

Biological Studies

195. Studies of phytoplankton, zooplankton, nekton, fish stomachs, meiobenthos, and macrobenthic biomass did not yield any information which could be used in assessing the impact of dredged material on aquatic communities.

196. Detailed analysis of dominant macrobenthic invertebrate species indicated that there appeared to be little, if any, impact of dredged material disposal upon these organisms. The validity of this conclusion rests upon a number of assumptions which were required in order to be able to analyze the macrobenthic data.

197. There was a pronounced seasonal decline in macrobenthic invertebrates in late summer. Disposal at that time appears to be preferable to other times in that adverse effects would probably be less than when populations are high.

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AD-A061 844 ARMY ENGINEER WATERWAYS EXPERIMENT STATION VICKSBURG MISS F/G 13/3
AQUATIC DISPOSAL FIELD INVESTIGATIONS GALVESTON, TEXAS, OFFSHOR--ETC(U)
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In accordance with letter from DAEN-RDC, DAEN-ASI dated 22 July 1977, Subject: Facsimile Catalog Cards for Laboratory Technical Publications, a facsimile catalog card in Library of Congress MARC format is reproduced below.

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Appendix C on microfiche in pocket.

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DREDGED MATERIAL RESEARCH PROGRAM

TECHNICAL REPORT D-77-20

AQUATIC DISPOSAL FIELD INVESTIGATIONS, GALVESTON, TEXAS, OFFSHORE DISPOSAL SITE

APPENDIX C: INVESTIGATION OF THE EFFECTS OF DREDGING AND DREDGED MATERIAL DISPOSAL ON OFFSHORE BIOTA

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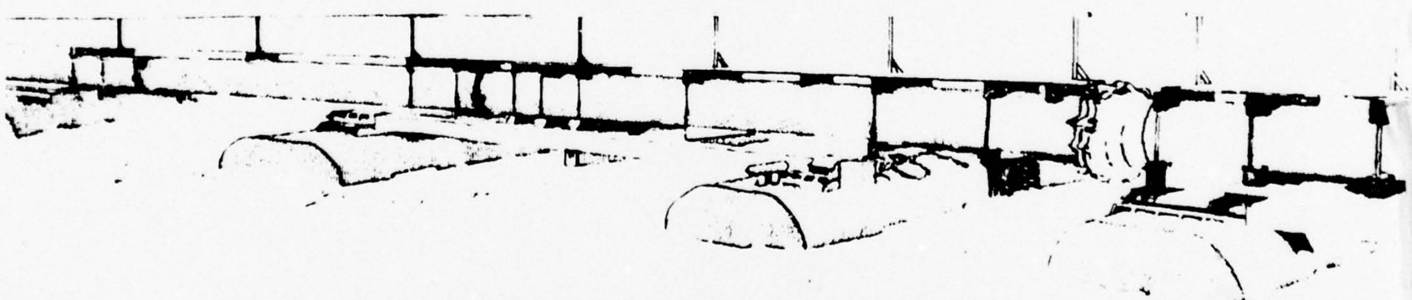
December 1977

Final Report



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Under Contract No. DACW64-76-C-0038
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Monitored by Environmental Effects Laboratory
U. S. Army Engineer Waterways Experiment Station
P. O. Box 631, Vicksburg, Miss. 39180

AQUATIC DISPOSAL FIELD INVESTIGATIONS,
GALVESTON, TEXAS, OFFSHORE DISPOSAL SITE

Appendix A: Investigation of the Hydraulic Regime and Physical Nature of Sedimentation

Appendix B: Investigation of Water-Quality Parameters and Physicochemical Parameters

Appendix C: Investigation of the Effects of Dredging and Dredged Material Disposal on Offshore Biota

DISCLAIMER

The primary objective of Contract DACW64-76-C-0038 was to determine the impact of dredged material disposal upon benthic, nektonic, and planktonic organisms within the Galveston, Texas, offshore dredged material disposal site. The study was to include determination of organism types and abundance prior to disposal and any changes that might occur after disposal. The Dredged Material Research Program (DMRP) personnel feel that several factors should be kept in mind by those desiring to use the findings of this study as stated in the conclusions.

First, an inadequate amount of predisposal data were obtained. Hence, it is not possible to ascertain conclusively if observed changes in the biota were related to disposal rather than normal seasonal fluctuations.

Second, no definitive method was developed for characterizing sampling stations affected by dredged material. Thus, the presence or absence of shell hash material and Beaumont clay cannot be used as a definitive means to differentiate between the presence or absence of dredged material and possible sediment compositional changes due to natural patterns of erosion and deposition. This problem is further complicated by the contractor's failure to use appropriate bathymetric aids.

Finally, the biological data base used in analysis and interpretation of dredged material effects is suspect due to several factors. Numerous data presented in the figures and tables of this report are not in agreement with raw data submitted separately by the contractor to this office. Additionally, there are computation errors in the figures in the report that were not corrected by the contractor during the review process, and the figures form the basis for several of the conclusions in this report.

In view of the problems described herein, the reader should be cautious when considering the appropriateness and validity of the data interpretations and conclusions of this report regarding the impacts of

dredged material disposal at the Galveston disposal site and in any attempts to extrapolate these study results to other dredged material disposal operations.

PREFACE

This report presents the results of the biological portion of a multi-faceted, 1.25-year field study to determine the environmental impact associated with dredging in the Galveston Channel and dredged material disposal in the Galveston offshore dredged material disposal site.

Although numerous individuals participated in the field and laboratory work necessary for the completion of this study, I wish to especially acknowledge the assistance of four persons: Dr. Bruce Sidner, formerly of the Texas A&M University Department of Oceanography, who undertook the tasks of analyzing the geological data from the last three field collections and writing the preliminary report after the original investigators left the project without writing the final report; Drs. Ernest L. Estes and Ronald J. Scrudato, Moody College, Texas A&M University, who undertook the task of writing the comprehensive final geological-physical report for the Galveston study after the administration of the Department of Oceanography decided it was not their department's responsibility; and Ms. Vicki Tyson, who gave up many evening and weekend hours to type and proofread the draft and final reports.

Messrs. James McMurray, captain of the R/V GUS III, and Steven Mann, captain of the R/V TEXAS STAR, piloted the research vessels used during this project.

Messrs. Clyde Henry, Steven Mann, Robert Salzer, Nick Vratis, and Ms. Christine Becker assisted me in analyzing benthic samples. Mr. Brandt Henningsen analyzed the trawl catches and fish stomach contents. Dr. William J. Wardle and Mr. Byron Giezentanner analyzed the meiofaunal samples. Messrs. Geoffrey Matthews and Thomas Minello analyzed the zooplankton samples. Ms. Linda Medlin analyzed the phytoplankton samples. Ms. Rebecca B. Jaschek, Christine Becker, Amy Schrum and Mr. Mark Kennedy assisted in the compilation of data. Numerous Moody College students assisted in making field collections.

Messrs. Robert J. Case and Clyde Henry performed the analysis of

data by computer. Dr. Robert W. Smith, University of Southern California generously allowed the use of his unpublished data classification program.

This study was monitored by the U. S. Army Corps of Engineers, Waterways Experiment Station (WES), Environmental Effects Laboratory (EEL), Vicksburg, Mississippi, under contract number DACW64-75-C-0038. The investigation was part of the Dredged Material Research Program which was sponsored by the Office, Chief of Engineers. The study was under the general supervision of Dr. Robert M. Engler, Manager, Environmental Impacts and Criteria Development Project, and Dr. John Harrison, Chief, EEL. During the investigation, Col. G. H. Hilt and Col J. L. Cannon were Directors of WES and Mr. F. R. Brown was Technical Director. The contract for the study was let by the U. S. Army Engineer District, Galveston. Col. Jon C. Vanden Bosch and Col. Don S. McCoy were Contracting Officers.

Messers. David Mathis, WES site manager and Steven Cobb, WES, participated in several field studies and provided many helpful suggestions during the project. Dr. Thomas Wright, WES, reviewed the final report.

Finally I wish to thank Mr. A. D. Rychlik and the staff of the Texas A&M Research Foundation for their support and assistance in completing this project.

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AN INVESTIGATION OF THE EFFECTS OF DREDGING AND DREDGED MATERIAL DISPOSAL ON THE OFFSHORE BIOTA AT GALVESTON, TEXAS

PART I: INTRODUCTION

Background

1. The Environmental Effects Laboratory (EEL) of the U. S. Army Corps of Engineers Waterways Experiment Station (WES) has established four regional field study sites to evaluate the environmental impacts associated with the disposal of dredged material in open (offshore) waters. The four study site locations include:

- a. The Pacific coast at the mouth of the Columbia River, Oregon;
- b. The Pacific coast at the mouth of the Duwamish River, Washington;
- c. In Lake Erie off Ashtabula, Ohio; and
- d. The Gulf of Mexico off Galveston, Texas.

An Atlantic coast site at Eatons Neck in Long Island Sound was cancelled because of local opposition to research activities (Environmental Effects Laboratory, 1975a, b). The research was part of the Aquatic Field Disposal Investigations of the Dredged Material Research Program being conducted by the Waterways Experiment Station.

2. Galveston is an appropriate location for a study of open-water disposal of dredged material. Site conditions are typical for much of the Gulf coast; most offshore disposal occurs within the 15-m isobath, and large quantities of material are disposed annually. The Galveston Channel system is a major artery for waterborne traffic entering and leaving the ports of Galveston, Texas City, and Houston. Because the entrance channel is perpendicular to the prevailing direction of sediment transport (southwest) and because of sediment transport into the channel by tidal currents, the outer reaches of the Galveston Channel system--the entrance channel, the outer and inner bar channels--must be

dredged on an annual basis to maintain the channel at its authorized depth of 12-12.5 m. An average of 1.42 million m^3 of sediments are removed from these portions of the channel and deposited in the designated offshore disposal area each year (Environmental Effects Laboratory, 1976). Only unpolluted material from the entrance channel and the bar channels is deposited offshore. In other parts of the Houston Ship Channel complex declared polluted by the Environmental Protection Agency (EPA), the sediments are hydraulically lifted from the channel bed and pumped to onshore diked disposal areas.

3. Maintenance dredging has been accomplished in recent years by the U. S. Army Corps of Engineers hopper dredge, McFARLAND, with a single load capacity of 2294 m^3, and, before she was sunk, the MacKENZIE. Maintenance dredging primarily involves removing the accumulated sand and mud (silt + clay) and occasionally some of the Beaumont Clay that forms the floor of the channel. Dredging is accomplished by lowering a hydraulic suction arm to the bed of the channel while the dredge is underway. The sediments are sucked into the head and pumped into onboard hopper bins. As the hoppers fill, excess water is vented over the side. The dredged material is transported offshore to the designated dredged material disposal site and released by opening the hopper doors while the vessel is underway. If the dredged material is sand or loose mud, the entire hopper load is vented in a few minutes at most. If, however, cohesive Beaumont Clay has been dredged, it may not readily drop through the doors and hours may be required to work the load out of the hoppers.

4. The Galveston area is an appropriate location for a study of the effects of dredged material disposal because of its biological and abiotic characteristics. The biota has components of both temperate and tropical climates--a result of tropical summer and temperate winter temperatures. The sediments are sandy inshore and silt-clay mixtures offshore, each with a characteristic assemblage of animals--all contained within the dredged material disposal site. These features allow simultaneous studies of different populations and perhaps allow conclusions to be drawn that are applicable to other Gulf regions.

5. The disposal of dredged material has occurred for years at Galveston and will continue, in all probability, for the foreseeable future. The alternative, no maintenance dredging, is economically unrealistic. The Galveston Channel would quickly shoal and limit the flow of raw materials and products in and out of Houston and Galveston, thereby affecting the economy of much of the central United States.

6. But, at the same time, information is needed on how man's activities affect the environment. If a specific activity is found to be deleterious, then ways can be explored to alleviate or at least reduce the impact. The Galveston dredged material disposal project at Galveston was initiated to determine the effects of open-water disposal and to make recommendations on ways to modify impacts associated with disposal.

Objectives

7. The Galveston study had numerous objectives that were carried out in three separate investigations. The objectives were to:

- *a*. Determine the nutrient and heavy metal concentration in sediments and to perform water-quality studies in the disposal area prior to disposal operations;
- *b*. Determine the dissolved and particulate materials that are released into the water from dredged material and the temporal and spatial extent to which released materials remain above ambient levels during and immediately after disposal;
- *c*. Determine the sedimentology, subbottom characteristics and bathymetry of the disposal area prior to disposal operations;
- *d*. Determine the erosion, transport, and deposition of dredged material after disposal and the changes in morphology and physical characteristics of the dredged material deposits;
- *e*. Determine the spatial and temporal distributions of the natural biological assemblages within the disposal area prior to disposal operations;
- *f*. Determine if changes occurred in the composition and abundance of the benthic and demersal assemblages after dredged material disposal, with particular emphasis on the

rate of recolonization of dredged material by benthic organisms;

g. Determine if changes occurred in the composition, abundance, and distribution of plankton as a result of disposal operations; and

h. Develop a set of widely applicable basic environmental data requirements for the evaluation of impacts associated with the open-water disposal of dredged materials.

8. Dr. G. Fred Lee, Institute for Environmental Studies, University of Texas at Dallas, headed the investigation to attain objectives a. and b. Dr. Arnold Bouma, Mr. Gary Hall, and Mr. Bruce Sidner, Department of Oceanography, Texas A&M University, conducted the studies to attain objectives c. and d. The biological studies, objectives e. through g., were conducted by personnel headed by the author at the Texas A&M Marine Laboratory, Moody College, in Galveston.

Study Design

9. The Galveston project was designed to be a sequential study involving three phases. These will be briefly discussed in this section to familiarize the reader with the study design and the methods that were actually followed.

The pilot study

10. The biota and nature of the substrate of the shallow waters offshore from Galveston are largely unknown. This is unfortunate considering the number of institutions of higher learning in the area with marine biology or oceanography programs. A pilot study of the Dredged Material Disposal Site (DMDS) was conducted during the period April 1-May 14, 1975 and was designed to be a short-term intensive survey of the biological, physical, and chemical characteristics of the DMDS and its surroundings. The DMDS was divided into subunits (hereafter referred to as blocks) from which samples for biological, sedimentological, and chemical analysis were taken (see Part VI). The data from these samples were used to select specific localities for subsequent study.

The predisposal study

11. When the areal distribution of the biota and sediments in the disposal area had been determined, five specific locations--two with predominantly sand substrates and three with predominantly silt-clay substrates--were chosen for more detailed study. The investigators planned to sample each of these locations bimonthly (every two months) for six months to a year. This study, which was originally planned to be a baseline study, was designed to provide information on the natural seasonal changes in the biological populations, sediments, and water quality in the DMDS prior to the initiation of experimental disposal activities. In actuality the baseline study was terminated after one collection in July because the McFARLAND arrived in Galveston in late August 1975 and dredged material disposal occurred from 24 August-24 September. Therefore, this portion of the study, which was simply a single predisposal sampling, is combined with the subsequent study for discussion purposes.

The experimental study

12. The experimental study was planned in two phases: an acute impact study and a long-term monitoring study. During the acute impact study, changes in water quality and plankton associated with the release of dredged material were to be measured. In addition, changes in the benthic populations at the disposal sites, compared with control populations, were to be determined.

13. During the monitoring study the rate of recolonization of the dredged material by benthic organisms was to be determined and the rate of removal of the dredged material by currents and wave action was to be studied.

PART II: LITERATURE REVIEW

Studies on the Benthos, Nekton, and Plankton in the Northwestern Gulf of Mexico

14. The status of knowledge concerning all aspects of the biota of the Gulf of Mexico was reviewed in Fishery Bulletin 89 published by the U. S. Fish and Wildlife Service (now the National Marine Fisheries Service) in 1954. The reader is referred to this publication for research reports antedating 1952. The following sections are not meant to be exhaustive surveys of the literature concerning the biotic groups. The literature reviews of the papers cited here will enable the reader to locate pertinent articles on more specialized topics.

Macrobenthos

15. Prior to 1940, knowledge of the sublittoral benthic assemblages of the Texas coast was virtually nonexistent except for a few checklists and miscellaneous reports. There have been only two macrobenthic offshore studies in the vicinity of Galveston, viz: those of Harper (1970) and Henry (1976). Harper's study involved the macrobenthos collected by dredging at 1.8-m depth increments along two transects extending offshore from Galveston Island and terminating in 11 m. Assemblages delineated by this study included those on sandy, mixed, and muddy bottoms, each with primary and secondary dominant organisms. Henry studied the macrobenthos in the entrance channel and on the bottoms on either side of the channel. His study, conducted concurrently with the present study, detected variations in the benthic populations missed by the bimonthly sampling pattern of the present study. The population densities in the channel were erratic, probably due to the continuous movement of sediments by tidal flow. It was hypothesized that maintenance dredging of the channel would prevent the establishment of a stable benthic population.

16. In the early 1950's, interest in oil deposits resulted in explorations sponsored by oil companies. They were particularly interested in studying recent sediments and fauna as a guide to past

geological history, and mollusks were emphasized in many studies because their remains are readily fossilized. Ladd (1951) and Ladd, Hedgpeth, and Post (1957) reported on the fauna (mostly mollusk remains) collected from the region around Rockport and Port Aransas, Texas. They recognized two offshore facies, the sandy bottom nearshore facies and the muddy bottom offshore facies. Pulley (1953) studied the distribution of bivalve mollusks along the entire Gulf of Mexico, and, based on the patterns he found, divided the Gulf into five zoogeographic provinces.

17. Hedgpeth (1953) divided the level bottom into two areas, the offshore sandy beach and the offshore bottoms, based on collections of macrobenthos by trawl. Hedgpeth (1954) recognized four benthic communities based on the larger invertebrates collected by trawl. His white shrimp grounds community included the depth range of the present study. Hildebrand described the fauna of the brown shrimp grounds (1954) and the pink shrimp grounds (1955) based on trawl catches by commercial shrimpers. Both of these grounds are well outside the present study area; the brown shrimp grounds lie in 22-91 m off the Texas coast and the pink shrimp grounds are located on the Campeche Bank off Mexico.

18. Hulings (1955) established a transect of 51 stations that extended from the shoreline near Sabine Pass, Texas, to a point about 28-km seaward; all stations were in 20-m depth or less. Of the 212 species collected by grabs, dredges, and cores, 72% were mollusks and most of those were dead. Kennedy (1959) collected dredge samples at 18 stations on a transect that extended from the shore near High Island, Texas, across the continental shelf. Two hundred forty-five species of mollusks were collected that were divided into 3 major assemblages, viz: a shallow shelf group, a transition group, and a deep shelf biofacies.

19. Parker (1960) conducted an extensive study of the northwestern Gulf of Mexico, and combining these data with data gathered on previous studies (1955, 1956, 1959), described estuarine, lagoonal, and continental shelf assemblages plus special assemblages from the prodelta slope off the Mississippi River, the calcareous banks offshore, and the upper continental slope. Again, mollusks played a large role in

determining assemblages. Only Parker's generalized inner shelf zone (3.5-21.5 m) applies to the present study, and Harper (1970) found that in the Galveston area, assemblages should have been subdivided into three more natural groups that corresponded with sediment types.

20. Keith and Hulings (1965) studied seasonal changes in the shallow sublittoral (1 m) fauna at five stations between Sabine Pass and Bolivar Point, Texas. They found that the sediments of the area were unstable and that most of the species were found exclusively on either sand or mud bottoms. They also found that sand dwellers were not affected by Hurricane CINDY (September 1963) but that mud dwellers were killed by oxygen depletion due to organic matter and hydrogen sulfide being churned up from the bottom. The first quantitative biomass measurements of the benthos on the continental shelf were made by Rowe, Polloni, and Horner (1974) at three offshore stations as part of a larger study involving the deep water benthos.

21. Harper and Case (1976) reported on the benthic macroinvertebrates collected in the vicinity of Freeport, Texas. This was one of the first offshore studies in the northwestern Gulf of Mexico in which all organisms were separated to the species level and the assemblages were based entirely on living organisms rather than dead shell material. Two large assemblages were delineated, viz: a nearshore assemblage that occurred in 9-m depth along the coast from San Luis Pass, at the southwestern end of Galveston Island, to Pass Cavallo at the mouth of Matagorda Bay, and an offshore assemblage that extended from 18-m to about 30-m depth. Most of the offshore samples were collected from muddy bottoms. Some stations, however, were located on what were probably old beach ridges and contained a high percentage of shell and sand. The diversity and populations were usually larger at these stations.

22. Gettleson (1976) examined the distribution and abundance of meiofauna and macroinfauna at 10 stations on the outer east Texas continental shelf. He found that the permanent meiofauna exceeded the macroinfauna by an average of 990:1 numerically. The meiofauna formed a single assemblage while the macroinfauna were divided into three assemblages corresponding to substrate differences.

23. Defenbaugh (1976) conducted a study of the macroinvertebrates collected by trawling in depth ranges of 18-183 m, primarily off the northern Gulf coast between Corpus Christi, Texas, and Pensacola, Florida. He proposed 12 faunal assemblages. The present study area lies within his "inner shelf assemblage, Texas Louisiana shelf (4-20 m)." Holland (1975) conducted a study off the south Texas continental shelf. Twenty stations are located on three transects that extend to the edge of the shelf. This project, still in progress, is part of the Bureau of Land Management's outer continental shelf study. The author is presently conducting a study of the macrobenthos in the vicinity of Buccaneer Oil Field, 50 km south of Galveston.

24. The benthic communities associated with carbonate banks offshore have been examined by Abbott and Bright (1975) and the faunal assemblages of the upper continental slope have been reviewed by Pequegnat (1976).

25. Information on the macrobenthos inhabiting other parts of the continental shelf of the northern Gulf of Mexico includes the following:

- a. Louisiana. A list of species occurring off Grand Isle by Behre (1950) and Dawson (1966), a discussion of the Mississippi Delta region by Parker (1956), a study of infaunal mollusks off the Mississippi Delta by Stanton and Evans (1971, 1972), a comprehensive survey of the larger invertebrates of the western Louisiana coast from the beach to about 36-m depth by Boyer (1970), and a study of the benthos in relation to oil wells in Timbalier Bay and adjacent offshore areas by Farrell (1974).

- b. Mississippi and Alabama. Lists of species occurring off Ocean Springs, Mississippi, by Ward et al. (1953), Tolbert and Walker (1953), Walker (1953), Richmond (1962, 1968), and Moore (1961); a list of macrobenthos off Alabama by Swingle (1971); and a list of macroepibenthos collected off Mississippi by Franks et al. (1972).

- c. Florida. A list of species of the St. George-Apalachee Bay region compiled by Menzel (1971); studies of the biota of the Florida Bay area by Tabb and Manning (1961) and Hudson, Allen, and Costello (1970); a continuing series of papers on data collected by the Marine Research Laboratory of the Florida Department of Natural Resources entitled

"Memoirs of the Hourglass Cruises"; results of an environmental study for a proposed power plant on the Anclote River near St. Petersburg by Baird et al. (1972), and descriptions of the benthic assemblages on the west Florida shelf by Collard and D'Asaro (1973) and Lyons and Collard (1974).

Meiofauna

26. The meiofauna of the Gulf of Mexico has been little investigated, and studies of entire communities have received even less attention. Pequegnat and Gettleson (1974) listed the numbers of individuals in major taxa from five stations in the vicinity of Stetson Bank off the Texas coast. Gettleson and Pequegnat (1976) examined the relationship between the occurrences of meiofaunal major taxa and sediment types at 24 stations on the outer Texas shelf. Gettleson (1976) examined the relationship between meiofauna and macroinvertebrates at 10 stations off the East Texas outer continental shelf. Ongoing studies include those of Pequegnat (personal communication, 1976, Department of Oceanography, Texas A&M University) in conjunction with the Bureau of Land Management's South Texas outer continental shelf study and of the author in the Buccaneer Field south of Galveston, Texas, as part of the National Marine Fisheries Service's study of existing energy production structures in the Gulf of Mexico.

27. Papers dealing with specific components of the meiofauna include studies of the Nematoda by Chitwood (1951), Chitwood and Timm (1954), Hopper (1961a, 1961b, 1963), and King (1962). Hulings (1967) provided a review of the work done on podocopid and platycopid ostracods in the Gulf of Mexico. Phleger (1960) reviewed the work done on the Foraminifera. Since that publication, other studies on sublittoral Gulf formainiferans include those by Walton (1964), Loep (1965), Anonymous (1966), Lankford (1966), Greiner (1970), Poag and Sweet (1971), and Buzas (1967, 1972).

Nekton

28. Prior to 1970, investigations of ichthyofaunal populations off the Texas and Louisiana coasts had been conducted in waters of less than 27-m depth. Gunter (1945) reported on the fish fauna of Aransas

and Copano Bays and the Gulf of Mexico, the first major study of this type off the Texas coast. Gunter (1950) also studied the seasonal distribution of invertebrates of the Texas coast and discussed the relationship with salinity. Hildebrand (1954) studied the nektonic community seaward of the 27-m isobath. Gunter (1958) conducted population studies of the shallow water fishes in south Texas. McFarland (1963a) studied the seasonality of populations and biomass of fishes in the surf zone off Mustang Island, Texas. Hoese (1965) studied the young and larvae of fishes in the Port Aransas area to establish spawning periods. Miller (1965) studied the migratory patterns and spawning periods of the shallow water (5-27 m) ichthyofauna off Port Aransas, Texas. Copeland (1965) and Hoese et al. (1968) reported on the movements of nektonic species in the Aransas Pass area.

29. Moore, Brusher, and Trent (1970) conducted an extensive survey of the demersal fishes off the Louisiana and Texas coasts from 7-110-m depth, studying distributions in relation to depth, season, and location along the coast. Chittenden and McEachran (1976) studied the demersal fishes inshore of the 91-m isobath in the northwestern Gulf. They recognized two communities that correlated with the white and brown shrimp grounds (3.5-22 m and 22-91 m, respectively) with a zone of overlap at 18-36 m.

30. The distribution of fish species in the northwestern Gulf has been listed by Springer and Bullis (1956), Hoese (1958), and Bullis and Thompson (1965). Roithmayr (1965) and Gunter (1967) reported the size and species composition of fish caught by commercial fleets in the northern Gulf. The catches of commercially important nektonic species were analyzed by NOAA (1976) with respect to area, depth zone of catch, and time of day of catch. The fishes of the offshore West Flower Garden banks were studied by Bright and Cashman (1974).

31. No attempt has been made to list the publications dealing specifically with commercial shrimp or blue crabs, although an extensive literature exists on these organisms. The reader is referred to NOAA (1976), Parker (1970), and Conte and Parker (1971).

32. In the eastern Gulf of Mexico, Franks (1970) and Franks et

al. (1972) listed the species of fishes and nektonic invertebrates collected off Mississippi. Swingle (1971) listed the species of fishes and nektonic invertebrates collected in the estuaries and offshore areas of Alabama. Briggs (1973) summarized the knowledge concerning fishes in the eastern Gulf of Mexico and provided an extensive bibliography.

Zooplankton

33. Few studies have been made of the biomass and composition of the zooplankton from the shelf waters of the Gulf of Mexico. Most reported studies have dealt with either taxonomy and distribution or life cycles. In Texas coastal waters, studies have involved the distribution and standing crop of the total net zooplankton (Drummond and Stein, 1955); the taxonomy and distribution of Chaetognatha (Pierce, 1962); the zooplankton biomass off the Texas coast and in most of the Gulf (Khromov, 1965); the vertical migration of penaeid shrimp larvae (Temple and Fischer, 1965), chaetognaths (Adelmann, 1967), and copepods (Allison, 1967); the seasonal distribution and reproduction periods of *Lucifer* (Harper, 1968); the zooplankton populations off Freeport, Texas (SEADOCK, 1975); and the biomass and species composition of zooplankton over the South Texas outer continental shelf (Park, 1975b). Fleminger (1959) did a study of the zooplankton in the East Lagoon at Galveston, which communicates with Bolivar Roads, and Bagnall (1976) studied the zooplankton of Christmas Bay, which communicates with San Luis Pass southwest of Galveston.

34. In the eastern Gulf, Gonzalez (1957) studied the copepods of the Mississippi Delta region. Cuzon du Rest (1963) reported numbers of several zooplankton groups from estuarine lakes in southeastern Louisiana. Gillespie (1971) did a seasonal study of zooplankton volume and numerical abundance of several taxa off the Louisiana coast. Woodmansee (1966) studied vertical migration patterns of the shrimp *Lucifer* off Mississippi. McIlwain (1968) studied the seasonal occurrences of copepods in Mississippi Sound. Perry and Christmas (1973) reported zooplankton volumes from Mississippi Sound and the Biloxi estuary in Mississippi. Zooplankton populations along the Florida west coast were studied by Grice (1956, 1957), Dragovich (1961, 1963),

Hopkins (1966), and Kelly and Dragovich (1967).

35. Studies encompassing broad areas of the Gulf include a taxonomic study on copepods (Fleminger, (1956), studies on euphausids (James, 1966), zooplankton biomass studies (Khromov, 1965), biomass studies by joint Russian-Cuban expeditions (Bogdanov et al., 1969), distribution and taxonomy of copepods (Park, 1970), abundance of copepods (Livingston, 1974), vertical distribution of copepods (Minello, 1974), taxonomy of copepods (Ferrari, 1965, 1973; Park, 1975a), and a study of the volume, occurrence, abundance, and diversity of copepods (Howey, 1976).

Phytoplankton

36. Reported studies of phytoplankton in the shelf waters of the western Gulf of Mexico are rare. Freese (1952) and Wood (1963) reported on the diatom flora associated with sediments in South Texas shallow waters. McFarland (1963b) measured seasonal productivity in the surf zone at Mustang Island, Texas. Van Baalen (1975) reported biomass and seasonal distributions of phytoplankton in the waters of the South Texas ou[illegible]al shelf. Zein-Elden (1961) measured phytoplankton pigments in the East Lagoon, Galveston, which communicates with Bolivar Roads.

37. The majority of work done on the phytoplankton has been conducted east of the Mississippi Delta, particularly along the Florida west coast where periodic outbreaks of red tide cause considerable mortalities among vertebrates and invertebrates. Thomas and Simmons (1960) and Simmons and Thomas (1962) studied phytoplankton production in the Mississippi Delta region. Woodmansee (1962) studied the distribution of planktonic diatoms in Biloxi Bay, Mississippi. Much of the information concerning phytoplankton production in the eastern Gulf and along the Florida west coast has been summarized by Steidinger (1973).

Zoogeography

38. The Gulf of Mexico has been considered to be entirely within the Caribbean (tropical) Province by some authors and to have both

Carolinean (temperate) and Caribbean biota by others. Woodward (1856), in a study of Mollusca, erected the Trans-Atlantic Province, which included the coastline of the eastern United States between Cape Cod and the Florida east coast, but not the Gulf of Mexico. He considered the northern Gulf of Mexico to be tropical. His system was followed by P. Fisher (1881) and P. H. Fisher (1950). More recently, Ekman (1953), Van Name (1945), Taylor (1955), Schilder (1956), Hall (1964), Robins (1971), and Gilbert (1973) have placed the Gulf in the Caribbean or tropical province.

39. Forbes (1856) divided the Trans-Atlantic Province into the Virginian and Carolinean Provinces with a boundary at Cape Hatteras. The Carolinean Province was bordered on the south by the Caribbean Province with the boundary located in the vicinity of the Florida-Georgia border. The boundary of the temperate-tropical provinces on the east coast has been placed at the tip of Florida (Woodward, 1856) to the vicinity of Cape Hatteras (Ekman, 1953) and numerous places in between. According to Briggs (1974), many authors agreed that the boundary is in the vicinity of Cape Kennedy.

40. Johnson (1934), in summarizing the molluscan provinces along the Atlantic coast of North America, noted that there was a strong influx of Trans-Atlantic species into the Gulf, which probably occurred prior to the formation of the Florida peninsula. Briggs (1974), on the other hand, believed that the northern Gulf has been a primary evolutionary center, because of its high endemism, and has contributed species to the Atlantic coast.

41. Among workers who recognize temperate and tropical provinces in the Gulf of Mexico, there has been disagreement about the locations of the boundaries. Hedgpeth (1953) recognized the temperate nature of the northern Gulf coast and extended the Carolinean Province into the Gulf of Mexico, fixing the southern limits at or about Tampa, Florida, in the eastern Gulf and the Texas-Mexico border in the western Gulf. Pulley (1953), in a study of bivalve mollusks, recognized the temperate nature of the northern Gulf, but chose to divide it into five separate provinces instead of including the entire region in the Carolinean

Province. He placed the southern limits of the temperate fauna at Cape Romano, near Naples, Florida, and Cabo Rojo, about halfway between Tuxpan and Tampico, on the Mexican coast.

42. In the eastern Gulf of Mexico, Tabb and Manning (1962) equated the invertebrates and fish fauna in northern Florida Bay with northern Gulf fauna, and Briggs (1974) proposed to place the temperate-tropical boundary at Cape Romano, Florida. Rehder (1954) and Coohmans (1962) indicated that tropical Mollusca extended north to Tampa Bay or the Cedar Keys. Springer and Woodburn (1960), however, found that the fish populations of Tampa Bay resembled the temperate Gulf populations. The boundary has not yet been well defined in the southeastern Gulf.

43. In the western Gulf, Pulley (1953) found no great faunal change between Tampico and Brownsville. Warmke and Abbott (1961) indicated that many tropical mollusk species' ranges stopped in the vicinity of Cabo Rojo. Gunter (1952) and Hildebrand (1955) stated that nearshore ichthyofauna from Tampico northward along the Texas coast was similar. Blanquilla Reef, near Cabo Rojo, is the northernmost living surface reef in the Gulf of Mexico, and Moore (1958) designated Cabo Rojo as the division between tropical and subtropical or temperate waters. Briggs (1974) concurred with this boundary.

44. Among the permanent residents of the region, two groups may be recognized by their spawning behavior: those that spawn in the fall or winter when temperatures are falling and those that spawn in the spring when temperatures are rising. Gunter (1945) has shown that spring and summer spawning fishes outnumber the fall and winter spawners by more than 4 to 1, and that the shrimp and crabs were all spring or summer spawners. Some of the fall spawners, e.g. *Micropogon undulatus* (croaker) were very abundant and important in the fauna. Ladd, Hedgpeth, and Post (1957) suggested that the central Texas coast lies in the transition zone between tropical (summer) and temperate (winter) environments.

45. The studies of Mackin (1971) indicated that the benthic macroinvertebrate population as a whole spawned in the spring in Trinity Bay and Lavaca Bay, Texas. But Gillard's (1974) data indicated that

spawning began during late fall in Trinity Bay. Williams (1972) and Poff (1973) showed distinct population increases of *Macoma mitchilli* (Bivalvia) in early winter while Mackin (1971) collected the largest numbers of *Macoma* in March. Inasmuch as estuarine species often breed in response to salinity changes, it may be unwise to rely too heavily on estuarine data to establish breeding patterns. Harper (1970) found evidence that the macrobenthos off Galveston included both spring and fall spawners. Harper and Case (1976) found evidence that the nearshore benthic infaunal populations began increasing in late fall while the offshore populations were still decreasing. Unfortunately, no data were collected between January and June on the latter project.

46. The deeper waters of the continental shelf off Texas harbor species with tropical affinities, including coral reefs where the submarine topography favors coral growth. The West Flower Garden banks, located 200 km south of Galveston, are the northernmost Gulf shallow water reefs. Many of the species listed by Moore (1958) from Blanquilla Reef are common to the West Flower Gardens (Bright et al., 1974).

47. The ichthyofauna of reefs is similar throughout the Gulf (Bright and Cashman, 1974; Smith et al., 1975) and tropical in affinity (cf Hildebrand et al., 1964; Gunter, 1952; Carranza, 1959; and Chavez, 1966). The tropical reef fish tend to be found farther out on the shelf in the northern Gulf. Chittenden and McEachran (1976) suggest that the junction of the tropical component in the Gulf may involve a gradual displacement of the tropical component in the direction of the outer shelf as one proceeds toward the northern Gulf of Mexico.

48. The biota of the Galveston region, in addition to being included in the Carolinean Province by various authors, has been placed in the Northwestern Gulf Province (Mississippi Delta to Matagorda Bay) by Pulley (1953) and the East Texas Province (midway between Sabine Lake and Galveston Bay to Matagorda Bay) by Parker (1960). It is doubtful that the temperate Gulf of Mexico needs to be divided into numerous provinces. The considerable research being conducted on the continental shelf by the Bureau of Land Mangement and other agencies charged with administering environmental quality studies will provide much needed

information on the zoogeographic limits of Gulf species.

Previous Studies on the Effects of Dredging and Dredged Material Disposal on the Benthos, Nekton, and Plankton

49. Most studies on the effects of dredging and dredged material disposal have been conducted in bays and estuaries where channels were being created or maintained or where buried deposits of sand, shell, or gravel were being extracted; studies on the effects of offshore dredging-related activities are mostly wanting. Field studies have been chiefly designed to detect gross changes in the populations before and after dredging or dredged material disposal. Some laboratory studies have been conducted to assess the effect of high suspended sediment concentrations on biota.

Benthos

50. The majority of dredged material related research has been conducted with benthic organisms. The benthos are mostly slow moving or sessile organisms that cannot readily escape the site of an environmental impact. The lack of motility, however, makes quantitative studies of the benthos much easier to conduct than studies of the more motile nekton or the transient and patchy plankton.

51. Many of the published studies have been primarily concerned with the effects of siltation on the commercially important American oyster, *Crassostrea virginica*. Numerous authors (Lunz, 1938; 1942; Butler, 1945; Wilson, 1950; Ingle, 1952; Mackin, 1962; Galtsoff, 1964; Harrison, 1967; U. S. Army Corps of Engineers, 1968; Havens and Loesch, 1970; Burg, 1973; McKinney, Bedinger, and Hopkins, 1976; Benefield, 1976) have found that oysters buried under silt or other dredged material are killed, but if a portion of the oyster's bill projects above the deposit, the oyster will survive. Studies of the discharge from operating dredges (Wilson, 1950; Mackin, 1962; Masch and Espey, 1967; May, 1973; Leathem et al., 1973) have determined that high density mud flows affected only those organisms on the level bottom, while raised areas, e.g. oyster reefs, were generally not affected and that mud flows

tended to gravity flow into depressions in the bottom. It has generally been found that mud flows do not contain toxic substances and that depressed oxygen levels are usually found only near the flow bottom (Ingle, Cuervels, and Leinecker, 1955; Biggs, 1970; May, 1973; Leathem et al., 1973). If the material being dredged is highly polluted, the mud flow or suspended sediments can have very depressed oxygen levels (U. S. Army Corps of Engineers, 1967; Servizi, Gordon, and Martens, 1969).

52. It has been determined that most macrobenthic organisms buried under dredged material or a high density mud flow are suffocated. However, it has also been found that repopulation of such areas is relatively rapid. Harrison (1967) found that recovery was relatively complete six months after disposal occurred in lower Chesapeake Bay. The Virginia Institute of Marine Science (1967) found that dredged material deposited in Chesapeake Bay was recolonized within a year. Pfitzenmeyer (1970) found that the population and biomass of benthic organisms in a disposal area in Chesapeake Bay were reduced 70 and 65%, respectively, but had recovered to predisposal levels in 12-18 months. Saila et al. (1972) found that a few benthic species survived burial by moving upward through the disposal material to reach the surface. They found that dredged material deposit surfaces that had been exposed for one to three years had high macrobenthic diversities. In Delaware Bay, Leatham et al. (1973) and Maurer et al. (1974) collected data that suggested recruitment into dredged material began within three months. Henry (1976) found that dredged material was repopulated rather quickly offshore from Galveston. He stated that populations appeared to reach stable densities within two months after disposal.

53. The recruitment of benthic organisms into newly dredged bottoms is affected by several abiotic factors, e.g. dissolved oxygen, water movement, temperature, and sediment characteristics. When bayshore property is developed by dredging, water circulation in the canals is often restricted. Oxygen levels may be decreased, especially during summer months, and the soft sediments that settle in the canals may become anaerobic. Under these conditions, benthic populations may fail

to diversify or attain large sizes. These conditions have been found in bayshore development sites in Florida (Taylor and Saloman, 1968; Sykes and Hall, 1970; Sykes, 1971; Lindall, Fable, and Collins, 1973; Lindall, Hall, and Saloman, 1973) and Texas (Gilmore and Trent, 1974). Reisch (1961) obtained similar results in a study of a marina in which water circulation was restricted.

54. If, however, water circulation is unrestricted, newly dredged bottoms may be repopulated quickly by larval recruitment and/or migration of adults from nearby areas. Hanks (1968) found that a newly created artificial pond acquired a stable community within a year. Dredged channels in Chesapeake Bay were generally found to have acquired near-normal populations within a year after dredging occurred, although the diversity may not have reached predredging or control levels (Harrison, 1967; Virginia Institute of Marine Science, 1967; Flemer et al., 1968; Pfitzenmeyer, 1970).

55. Godcharles' (1971) study of the effects of hydraulic harvesting of clams in Florida estuaries indicated that populations were similar in dredged and nondredged areas after one year. Stickney and Perlmutter (1975) determined that the fauna of a newly dredged portion of the Intracoastal Waterway in Georgia was similar to control populations within two months of dredging. Henry (1976) found that Galveston Channel benthic populations approached predredging levels within four months, but he suggested that continual sediment movement and maintenance dredging would prevent the establishment of a stable community. Bardarik, Alden, and Shema (no date) could detect no effects of sand and gravel dredging on the riffle benthos in the Allegheny River. Reish (1963) reported that climax communities occurred in a marina in two years when water circulation was not restricted. On the other hand, Harper and Hopkins (1976) found that recruitment into newly dredged holes in San Antonio Bay, Texas, did not occur for about nine months, until the bottom had compacted, and that it took about four years for the benthic populations in dredged holes to attain 80% of the size of the populations on undredged flats. Rogers (1976) found that the recovery of meiofaunal populations in dredged areas in San Antonio

Bay, Texas, was about 80% complete 10 years after dredging occurred.

Nekton

56. The nekton, unlike the benthos, are mobile and can migrate away from areas unfavorable to their survival. Increased turbidities are the dredging-disposal related environmental changes most likely to affect the nekton. Researchers have killed estuarine fish (Ingle, Cuervels, and Leinecker, 1955) and freshwater fish (Wallen, 1951) in the laboratory by subjecting them to dense concentrations of mud and clay particles; death was attributed to the gills being clogged with silt. The concentrations required to kill fish, however, were much higher than can be maintained in a bay or lake environment. Southgate (1960), Jones (1962), and O'Connor and Sherk (1975) observed damage to the gill lamellae of some fish associated with highly turbid water: e.g., thickening on the gill lamellae, fusion of lamellae cells, and deterioration of the lamellae. O'Connor and Sherk (1975) also noted that many experimental fish exhibited stress behavior and tried to escape when they were subjected to dense suspended mud concentrations.

57. In contrast to laboratory studies, estuarine field studies in Alabama (Ingle, 1952), Louisiana (Viosca, 1958), and Texas (Harper and Hopkins, 1976) have shown that fish and shrimp tend to congregate in the mud plume from an operating dredge. Movement into the turbid water may have been in response to resuspended food materials or to escape sight-feeding predators.

58. Ritchie (1970) studied the effects of dredging and disposal on fishes in Chesapeake Bay and observed no gross detrimental effects on either free or caged adult fish or on their eggs or larvae in or near dredging operations; Ritchie also stated that fish population fluctuations were most influenced by seasonal temperature and salinity changes rather than by dredged material disposal. He suggested that dredged material disposal should occur in midwinter when fish abundance was low.

59. Bardarik, Alden, and Shema (no date) observed no effect on fishes from sand and gravel dredging in the Allegheny River. Briggs and O'Connor (1971) observed that fish populations of a shallow New York estuary preferred naturally vegetated bottoms over that offered by

dredged sand deposits. Stickney (1972) noted no dredging effects on ichthyofauna of a Georgia estuary. Neither Case (1974) nor Harper and Hopkins (1976) could detect detrimental effects on the nekton of San Antonio Bay, Texas, due to dredging. No significant differences in numbers or diversities of fishes have been observed between dredged material disposal sites and natural areas off either the mouths of the Sabine-Neches Waterway or Galveston Bay (U. S. Army Corps of Engineers, 1975a; 1975b). Limited sampling off Freeport, Texas, by the Corps of Engineers (1976) indicated that more species of fish were associated with a dredged material disposal area than with a nearby unaltered area.

60. It has been noted by the U. S. Army Corps of Engineers (1974, 1975a, 1975b) that dredged channels can serve as fish refuges in winter months because warmer water is retained in the deeper channels as compared to adjacent shallower areas. Murawski (1969) agreed, but also stated that dredged holes may contain low dissolved oxygen or high hydrogen sulfide levels and may lack benthos; under such conditions fish populations could not be sustained.

61. Taylor and Saloman (1968), in a study of the effects of dredging in Boca Ciega Bay, Florida, found that more fish species preferred areas outside dredged canals, and that the species present in the canals were predominantly midwater fishes. Although fewer fish species were present in the canals, total biomasses were higher than in adjacent waters. A study of the fauna in dredged canals of southern Louisiana by Adkins and Bowman (1976) showed that the largest nekton populations were found associated with the open, undisturbed control areas.

Zooplankton

62. Studies on the effects of dredging activities on zooplankton are lacking. Flemer et al. (1968) detected no gross effects on the zooplankton due to dredging in Chesapeake Bay. O'Connor and Sherk (1975) subjected the copepods, *Acartia tonsa* and *Eurytemora affinis*, to dense concentrations of silt in the laboratory and effected an initial reduction in the feeding rate of both species; the feeding rate of *Acartia* remained low while that of *Eurytemora* returned to control values after three hr.

Phytoplankton

63. Field studies conducted by Flemer et al. (1968) and Flemer (1970) in Chesapeake Bay indicated that phytoplankton production was reduced to about one-third of ambient in dredging-created turbid water and that the suppression lasted until ambient conditions were reestablished. The phosphate and nitrate content of the water increased 50 and 1000 times, respectively, but caused no phytoplankton bloom.

64. Corless and Trent (1971) compared phytoplankton production in a channelized housing development, an unaltered marsh, and an open bay in Texas. The production in the canals was 8% higher than in the marsh and 48% higher than in the bay.

65. A study by Vittor (1972, 1973) in Alabama indicated that phytoplankton cell densities in the water column increased while dredging occurred. This may have been due to the suspension of benthic algal organisms as the bottom was disturbed.

66. In the laboratory, O'Connor and Sherk (1975) detected up to 80% reduction in phytoplankton production in turbid waters as compared with controls. The reduction occurred as the amount of light penetrating the water decreased.

Benthic plants

67. In 1959 the Gulf Intracoastal Waterway channel was dredged through Redfish Bay, Texas, a very shallow bay with extensive beds of turtle grass *(Thalassia)*. The distribution of the sediments deposited along the edge of the channel was described by Hellier and Kornicker (1962), and Odum (1963) described the effects of channel dredging on the vegetation. They found that the sediment continued to spread from the banks for months after dredging stopped and that a temporary decrease in photosynthesis occurred. The next year, however, an exceptionally good growth of plants was observed in areas not smothered by silt. Nutrients released by dredging may have caused the growth.

68. Godcharles (1971) studied the effect of harvesting small clams hydraulically on benthic communities in Florida. Sea grasses had not recolonized any dredged area within a year after dredging occurred.

PART III: THE STUDY AREA

69. Galveston Island is part of a chain of geologically Recent barrier islands that skirt the greater part of the northwestern Gulf of Mexico. The island, which has a northeast-southwest trend, is about 48 km long and tapers from an eastern width of about 4 km to a blunt point at the western end. West Bay, which borders most of the landward side of Galveston Island, is continuous with the other bodies of water that constitute the Galveston Bay system: Galveston Bay, Trinity Bay, and East Bay. Galveston Island is separated from Bolivar Peninsula to the northeast by Bolivar Roads and from the mainland to the southwest by San Luis Pass (Figure 1). Two jetties, north and south, project into the Gulf in an easterly direction from Bolivar Peninsula and Galveston Island, respectively.

70. The principal study area for the biological investigations was the dredged material disposal site offshore from Galveston. Other study areas included a segment of the entrance channel and a possible control site northeast of the entrance channel. This latter site was found to be sedimentologically and biologically different from the disposal area and was therefore abandoned.

Dredged Material Disposal Site

71. The northern corner of the DMDS is approximately 4.3 km southeast of the old lighthouse on the end of the south jetty. The DMDS is nearly rectangular, with sides of 5.6 km by 3.2 km; the rectangularity of the site is destroyed by the oblique northwestern margin (Figure 2). The long axis of the site is oriented northwest-southeast, perpendicular to coastal trend. It is bounded by parallels 29°18.0' and 29°14.4', north latitude on the north and south corners, respectively, and by parallels 94°37.1' and 94°41.5' west longitude on the east and west corners, respectively. There are no markers delineating the periphery of the DMDS. One may, however, approximate the northeastern boundary by aligning the south jetty light with buoy 10 in the outer bar

channel or by running a line 128° from the lighthouse. One may approximate the northwestern boundary by running a line 232° from the sea buoy. It is, therefore, relatively easy for a moderately experienced helmsman or navigator with a radar unit to determine when his vessel has entered the disposal site.

Galveston Ship Channel

72. There are three legs of the Galveston channel system from which dredged material is removed and deposited offshore: the entrance channel, the outer bar channel, and the inner bar channel (Figure 2). The entrance channel bears 294° from the sea buoy. It is 7.8 km long and 240 m wide and has a controlling depth of 12.6 m below mean low water (MLW). The outer bar channel bears 275° from its junction with the entrance channel. It is 1.4 km long and 240 m wide and has a controlling depth of 12.6 m below MLW. The inner bar channel bears 259° from its junction with the outer bar channel. It is 4.4 km long and 240 m wide and has a controlling depth of 12 m below MLW (National Ocean Survey chart 11323, edition 37, 26 April 1975). The inner and outer bar channels lie entirely within the jetties. Most of the entrance channel is unprotected.

Abiotic Characteristics of the Study Area

Climate

73. The climate of the Galveston area is subtropical with short, mild winters and long, hot summers. Summer conditions extend from about May through September with highest temperatures occurring in July and August. Winter conditions extend from December through February, when intrusions of cold, dry air alternate with warmer, more humid days. Long periods of subfreezing temperatures are rare, and significant amounts of snow are even rarer (SEADOCK, 1975).

74. According to Thornwaite's (1948) system (followed by Hedgpeth, 1953) the climate of the Gulf coast ranges from semi-arid

(<63 cm of rain/year) in southwest Texas to humid (>152 cm of rain/year) from Louisiana to Texas. Galveston (114 to 152 cm of rain/year) lies in the transition zone between the moist subhumid zone (Port Lavaca to Galveston), in which moisture loss and gain are balanced or tend toward a surplus, and the humid zone (Galveston to Florida) with a moderate moisture excess. Parker (1960) modified Thornwaite's system somewhat by including the coast of Texas from the Texas-Louisiana border to Matagorda Bay in the moist subhumid zone (receiving 76-127 cm of rain/year) and Matagorda Bay to Corpus Christi in the dry subhumid zone (25-76 cm of rain/year).

75. The average annual rainfall in the Galveston area between 1931 and 1960 was 106 cm/year. After subtracting evaporation and plant transpiration, the Galveston-Houston area had from 12.7 to 20.3 cm/year excess moisture from precipitation. The area also had a more uniform rainfall distribution than the coastline to the southwest (Fisher et al., 1972; SEADOCK, 1975).

76. The average annual air temperature, 1930 to 1960, in the Houston-Galveston area was 21°C (Bouma et al., 1976; Fisher et al., 1972). The average calendar seasonal temperatures were: winter, 18.3°C; spring, 20.5°C; summer, 28°C; and fall, 22.2°C. Temperature maxima were rarely above 32°C. Average monthly temperature data recorded from Galveston are shown in Table 1.

Water temperature

77. Historical water temperature data from the vicinity of Galveston were obtained from:

a. National Ocean Survey water temperature records from the Galveston Channel at Pier 22, 1922-1975 (unpublished);

b. Published (Temple, Harrington, and Martin, 1977) and unpublished data collected by personnel of the National Marine Fisheries Service (NMFS), 1963-1965; and

c. Nearshore surface water temperature data collected by Harper (1970), 1968-1969.

78. According to National Ocean Survey records, the trend of the average monthly water temperature (1922-1975) was a smooth, almost bell-

shaped curve (Figure 3). For five months, January, February, March, November, and December, the average temperature was less than 20°C. For two months, July and August, it was slightly above 30°C.

79. The National Ocean Survey data also indicated that the average water temperature for the Galveston area has decreased. Table 2 compares the average monthly water temperatures for the periods 1922 through 1949 and 1950 through 1975. The average monthly temperatures were lower in all months in the 1950-1975 period, but the decrease was largest in the winter months. A consequence of an increasing disparity between summer and winter temperatures might be the inability of many stenothermal organisms to survive the entire year.

80. In Figure 4 the average annual water temperatures (data in Table A1) are compared with temperatures from the warmest month, August, and the coolest month, January. The average annual temperatures have decreased gradually and for the past 10 years have fluctuated slightly around 22°C.

81. The average August water temperature remained remarkably constant throughout the 54-year period, oscillating slightly above and below 30°C. Two major perturbations occurred during this period: between 1925 and 1929, the average August temperature increased from 30 to 33.5°C [the maximum recorded Galveston Channel water temperature was 38.9°C (102°F) in August 1929]; and between 1964 and 1967, the average temperature decreased from 30 to 28°C.

82. The average January water temperature has been much more variable than the August temperature. Figure 4 indicates a trend of decreasing water temperature through the 1960's. This decrease is demonstrated in Table 3, which lists the average January water temperature for 10-year intervals (the first and last years of the intervals are somewhat arbitrary but were chosen because a nine-year period (1949-1957) of warmer temperatures was immediately followed by an 11-year period (1958-1968) of generally cooler temperatures). Average January water temperatures were highest between 1922 and 1938. Since then there have been alternating temperature decreases and increases to the present, but the overall trend has been toward lower temperatures.

83. Temple, Harrington, and Martin (1977) plotted the monthly average surface and bottom water temperatures recorded in 5 depth zones in the northwestern Gulf of Mexico during the NMFS study, viz: 7.3, 13.7, 27.5, 45.8, and 73.2 m depths. Within each depth zone the temperature trends were similar between years and differences between depths were consistent. At 7.3- and 13.7-m stations (well within the depth range of the dredged material disposal site), the water column was essentially isothermal except in the spring when the bottom water warmed more slowly than the surface water. At 27.5 m and deeper, the disparity between surface and bottom water increased.

84. Station W53 of the NMFS study was located approximately 1200 m southeast of the south jetty lighthouse, somewhat less than half the distance from the jetty to the DMDS (29°19' north latitude, 94°41' west longitude) (Figure 2). Because station W53 was not on a transect, the water temperature data have not been published and were supplied by Mr. Robert F. Temple, formerly of the NMFS Galveston Laboratory. The data from NMFS station W53 (supplemented by data from station W55) off San Luis Pass in 7.3-m depth (Table A2), agreed with the findings of Temple et al. (1977); the water column was virtually isothermal except for one or two months during the spring warming trend and the trends were similar from year to year (Figure 5). The water temperature trends off Galveston Island recorded by Harper (1970) were similar to those of the NMFS study (Figure 6; Table A3).

85. During the present study, the water column was usually isothermal and followed essentially the same temporal trend as previously described (Figure 7, Table A4; if temperatures were similar for several consecutive days, they were averaged and reduced to one data point). On a short-term basis, however, the temperature of the water in the study area can change quickly; a 6°C increase in temperature occurred between 15 April and 3 May and a 4°C decrease occurred between 20 and 28 September. The sediment temperature was more stable on a day-to-day basis (Table A4). The sediment temperature gradually increased to a summer high of 28°C and gradually decreased to a winter low of 12°C (Figure 7). On the few occasions when the temperature of the deeper

sediment (10-20 cm subsurface) of a sample was recorded, it was observed that the deeper sediment was one to two degrees cooler in the summer and one to two degrees warmer in the winter than the near surface sediments. It would appear that the deeper dwelling benthos enjoy a habitat not subjected to erratic temperature fluctuations.

86. The temperature trends recorded in Galveston Channel in 1974 and 1975 (Figure 8) indicated that temperatures were near normal in both years and should not have caused a major change in biological populations prior to or during the study.

Freshwater discharge

87. The Trinity River, with a drainage area of 45,242 km^2 is the principal source of fresh water entering the Galveston Bay complex. This river discharges its water into upper Trinity Bay via several distributaries. The San Jacinto River system is the second major source of fresh water. The water from its 7323 km^2 drainage area flowed directly into upper Galveston Bay prior to 1954. On 9 April 1954, water storage began in Lake Houston; since then water from the San Jacinto River system has directly entered upper Galveston Bay only when the lake level was higher than the spillway crest. Most of the remaining fresh water input into Galveston Bay is via numerous bayous that snake through the Houston area and Harris County.

88. Prior to the 1930's the egress of fresh water into the Gulf of Mexico was hindered to some extent by the presence of Redfish Reef, which crossed Galveston Bay from Redfish Point to Eagle Point. The barrier was so effective that salinities in upper Galveston Bay and Trinity Bay were very low. Galtsoff (1931) studied the oyster beds of Texas bays and found that oyster production on both sides of Redfish Reef was poor; the salinity was too low on the north side and too high on the south side (the high salinity *per se* was not detrimental to the oysters but permitted the survival of oyster pests, predators, and diseases). He recommended that portions of Redfish Reef be dredged to permit greater mixing of saltwater and freshwater masses. This was accomplished in the 1930's and since that time lower Galveston Bay has had a more constant inflow of fresh water. The fluctuations in the

amount of fresh water being discharged determine the salinity of the Galveston Bay complex and, to some extent, the DMDS because it lies in the path of the water being discharged from Galveston Bay.

89. The average monthly freshwater discharge (1950-1975) into Galveston Bay is compared with the average monthly salinity (1950-1975) in Galveston Channel in Figure 9 (freshwater discharge data in Table A5). The freshwater and salinity trends are inversely correlated except during the months of November and December. The annual average freshwater discharge is compared with the average of the annual freshwater discharge for a 26-year period (1950-1975) in Figure 10 (data in Table A6).

Salinity

90. Historical salinity data from the vicinity of Galveston were obtained from:

a. National Ocean Survey data from the Galveston Channel, 1922-1975, and the Flagship Pier in Galveston (as water density data), and

b. Nearshore surface salinity data collected by Harper (1970), 1968-1969.

These data were compared with recent freshwater discharge data collected from rivers and streams flowing into the Trinity Bay-Galveston Bay complex by U. S. Geological Survey personnel. Salinity data from NMFS station W53 off the south jetty are not available, but 1963-1965 data from station W55 (in 7.3-m depth off San Luis Pass) were included for comparison (Temple et al., 1977).

91. The average (1923-1975) monthly Galveston Channel salinities (derived by conversion of National Ocean Survey density data) decreased gradually from January to a low in May. The May salinity low was followed by a rapid increase to an August high, followed by a decreasing trend (a slight increase occurred in November) through December (Figure 11). On the average, the salinity ranged from 20.5 ppt in May to 28.5 ppt in August.

92. Galveston Channel water would be classified as polyhaline brackish water (Redeke, 1933), oligohaline marine water (Ekman, 1953), (mixo) polyhaline water ["The Venice System of 1958" according to Remane

and Schlieper (1971)], or brackyhaline sea water (Hiltermann, 1949, 1966), all of which refer to a salinity range of about 18 to 30 ppt. There is a plethora of terminology associated with the salinity gradient from fresh water to sea water, but, as Remane and Schlieper (1971) remarked, "It is more difficult to demark brackish water from sea and fresh water since all gradations occur and any boundary is artificial."

93. The annual average salinities recorded in the Galveston Channel show distinct trends of increasing and decreasing salinities (Figure 12; data in Table A7). The mean salinity from 1922 through 1975 was 24.2 ppt. Low salinities occurred between 1923 and 1926, followed by 10 years of moderate to low salinities. Low salinities prevailed between 1941 and 1950. The effect of the "seven-year drouth" may be seen between 1951 and 1956 when the salinities were higher than average. In 1954, the year of the highest average salinity recorded, the July and August salinity maxima were 37.1 and 37.5 ppt, respectively, while minima were 29.9 and 32.5 ppt, respectively. These high values indicate that freshwater discharge into the Galveston Bay system was so low that evaporation exceeded input. Following the drouth were four years of near average salinities. From 1962-1971 the salinity was average or above average except for 1968. The last three years for which records are available (1972-1975), have been low salinity years.

94. National Ocean Survey data also show that salinities for the Galveston area have increased since 1922. Table 4 compares the average salinity each month for the periods 1922 through 1949 and 1950 through 1975. In all months except August, September, and October, the average salinity has increased at least 1 ppt; the March increase was 3.5 ppt. This increase may be related to increased water impoundment or diversion and usage along the rivers and streams draining into Galveston Bay.

95. Temple et al. (1977) described the monthly average surface and bottom water salinity trends for 5 depth zones, 7.3, 13.7, 27.5, 45.8, and 73.2 m, in the northwestern Gulf of Mexico. Within each depth zone, the trends were similar between years and differences between depths were consistent between years. The water was essentially isohaline in the 7.3-m depth zone. At the 13.7-m stations, the bottom

salinity was slightly more stable than the surface salinity and became more stable with increasing depth. The authors noted that marked decreases in surface salinity along the Texas coast were related to peak discharge of the Mississippi River, although there was a time lag of one to two months.

96. The salinity trends from NMFS station W55, off San Luis Pass in 7.3-m depth, are shown in Figure 13 (Table A8). In each year the lowest salinity was recorded in or near May and the highest in August. The waters were essentially isohaline as described by Temple et al. (1977). The salinity trends followed the pattern of the Galveston Channel water, but the salinities were generally higher. Salinity decreases caused by local freshwater discharge were evident each spring (May).

97. The data of Harper (1970; Table A9) were compared in Figure 14 with the average salinity data collected off the Flagship Pier each month for the 1968-1969 period of study. Trends for both data sets are similar and reflect a low salinity in late August through September followed by higher salinities in November and December. This trend deviates from the monthly average salinity trend depicted in Figure 11 and illustrates the variability in salinity due to irregular rainfall and subsequent freshwater discharge. The salinity of Galveston area waters is a more difficult environmental factor to predict than is temperature.

98. The salinity data recorded during the present study are depicted in Figure 15 (data in Table A10). As with temperature data, similar salinity data points recorded over several days were averaged and presented as one data point. During April through June 1975, the surface salinity was less than 22 ppt, reaching an average low of 10.8 ppt on 3 May. The surface salinity increased rather rapidly between late June and mid-July to 31 ppt, or higher. No samples were taken in August.

99. By early September, the surface water salinity had decreased to near 25 ppt and for the remainder of the study, fluctuated 2 to 3 ppt above and below 25 ppt. The bottom water salinity generally followed

the surface water salinity trend, but was usually 1 to 2 ppt higher. There was an apparent intrusion of high salinity bottom water into the study area in late March-early April.

100. The trends described by data collected during this study correspond with the National Ocean Survey data trends, but the Galveston Channel average salinities were generally lower. Salinity data were also gathered at the Flagship Hotel pier by the National Ocean Survey, and these data (Figure 16) corresponded more closely to our surface water salinities than did the Galveston Channel data.

101. Figure 17 depicts the monthly Galveston Channel salinities in 1974 and 1975, both prior to and during the present study. These data are compared with the average monthly salinity for the period 1950-1975. In 1974, the salinity was lower than average in spring, near average in the summer, and much below average in the fall. The very low salinity conditions continued through the spring of 1975. The salinities increased during the second half of 1975, but remained below average. The very low salinities present during the fall and spring of 1974-1975 may have resulted in the recruitment of species that could not tolerate the higher salinities later in 1975. One puzzling aspect of this study was the virtual disappearance of the acorn worm *Balanoglossus* between April and July 1975, concomitant with the salinity increase. This organism was present in calculated abundances in excess of 10,000 individuals/m^2 in some samples collected in May 1975. Its populations were reduced in June and July and were absent from the September samples.

Hydrographic climate

102. As is evident from the preceding discussion of historical temperature and salinity data, the hydrographic climate of Galveston has changed. Figure 18 depicts the climatic trends for the periods 1922-1949 and 1950-1975. The climate for the period 1922-1949 was similar to the climate depicted by Hedgpeth (1953), but the 1950-1975 climate was different primarily because the average salinity had increased. The two diagrams are nearly contiguous from August through October, indicating that water temperature and salinity during the summer months have

changed little with time. The greatest change occurred in the winter-spring months, December through April.

Bathymetry

103. According to data collected during the pilot survey (Bouma et al., 1976), the bottom of the DMDS was smooth with a gradient of about 1 m/km. Water depths ranged from 9.6 m at the western corner to 15.5 m along the southeastern boundary. Isobaths were regularly spaced and tended to parallel the coastline (Figure 19).

104. To the north of the disposal area, two topographic highs disrupted the smooth bottom gradient. The larger high covered an area of about 2.5 km^2 with a maximum relief of 1.2 m. According to Bouma et al. (1976), the mound resulted from dredged material disposal; sediment samples contained large chunks of Beaumont Clay dredged from the entrance channel. The smaller high, which covered an area of approximately 0.4 km^2 and having a maximum relief of about 0.6 m, may have been a dredged material disposal mound also.

105. The controlling depth of the entrance and outer bar channels is 21.6 m below MLW. The inner bar channel controlling depth is 12 m below MLW. Depths of the channels change constantly as sediments are either transported into the channel or removed by maintenance dredging.

Sediments

106. The sediments of the DMDS were sampled by geological oceanographers (Coulthard, 1976) and by biologists during the pilot study. These data, briefly described here, are reported in greater detail in the report on the physical-geological aspects of this study.

107. Coulthard's analysis indicated that there were three major sediment regimes in the DMDS. A narrow band of clayey sand intruded in the northern corner. This sand graded into sand-silt-clay, which occupied the remainder of the DMDS except for a large patch of silty clay that intruded into the DMDS from the southwest (Figure 20). Sedimentological data collected by the biological investigators also indicated there were three major sediment regimes, but did not agree with Coulthard's analysis (Figure 21). A band of sediments ran diagonally across the DMDS from west to east (interrupted in the middle) having ap-

proximately equal percentages of sand and mud (silt-clay). To the north and east of the band, the sediments were primarily sandy, while to the south and west silt-clay predominated.

Wind and waves

108. Two principal wind regimes dominate the coastal area of Texas: southeasterly winds that blow persistently from March through November and short-lived strong northerly winds ("northers") from December through February (Fisher et al., 1972). On an annual average basis, winds blow from the southeast quadrant about 50% of the time at an average speed of 5.7 m/sec, and from the north or northeast about 30% of the time with an average speed of 6.7 m/sec (SEADOCK, 1975).

109. Generally the seas are calm in the summer and fall and moderate in the winter and early spring. Waves greater than 2 m in height occur 20% of the time. Wave periods are less than 8 sec 80% of the time. Prevailing winds from the southeast develop swells that are translated into extensive wave trains when the waves contact the bottom. Coastal waves often "feel" bottom in 30 m of water and can cause the suspension of sediment into the water column (Fisher et al., 1972; SEADOCK, 1975). According to Curray (1960) most of the shelf within the 18-m isobath will have wave surges capable of moving fine sand about 5% of the time. Waves "feel" the bottom when the water depth is one-half the wave length. The wave length, L, may be calculated from the period by the formula $\left| L = 1.56T^2 \right|$ (modified for metric system from Bascom, 1971), where T is the wave period. Therefore, the depth at which a wave of a given period will contact the bottom may be calculated using the formula $\left| L = \frac{1.56T^2}{2} \right|$. The DMDS is in shallow enough water that waves with periods of 3.6 and 4.5 sec will "feel" bottom at the inshore and offshore boundaries of the DMDS, respectively. Wind speeds of 7.2 m/sec and 9.1 m/sec will produce waves of 4 and 5.1 sec, respectively, assuming minimum fetch and duration conditions are met (Williams, 1962).

110. Wind data collected at the Buccaneer Platform, 50 km south of Galveston, from 1970 through 1972 indicated that winds in excess of 8.6 m/sec occurred from the northeast through the southwest about 25% of the time. It was also determined that the annual average wind speed

recorded at the Buccaneer Platform was 7.0 m/sec, almost 4.5 m/sec faster than was recorded over land at Galveston (SEADOCK, 1975).

111. It is evident from the above data that water depths in the DMDS are sufficiently shallow to allow bottom agitation by waves at least 25% of the time. Turbid water conditions occur frequently in the offshore Galveston area, much of it due to wave action. During periods when small craft warnings are posted (winds up to 17 m/sec), the water is usually turbid almost to the horizon. During gale force winds, which occur infrequently (winds of 17-24 m/sec), the water assumes a chocolate brown color from the suspension of bottom material. Seas occasionally become so large that the entrance channel is closed to vessel traffic--this occurred once during the project and caused the postponement of a scheduled experimental disposal study because the McFARLAND had to remain in port.

112. Strong north winds occur most frequently during December through February although they may occur 2 months prior to or subsequent to this period. Northerly winds with speeds of up to 22 m/sec accompanying the storms effectively flatten nearshore waves, but can generate waves in excess of 3 m offshore. During northers, wind pressure piles bay water up on the backside of Galveston Island and Bolivar Peninsula; the resulting hydrostatic head enhances ebb tides and partially neutralizes flood tides (Fisher et al., 1972). If the cold air accompanying the front drops the bay water temperature quickly, the organisms in the DMDS could be subjected to a very rapid temperature change as the ebb tide flows out of the bay.

113. Wave activity in the study area had a great effect on this study. The short-period waves kept the research vessel in constant motion, and frequently waves were approaching simultaneously from two or three directions. Waves often were running 50 to 90° to the wind or current, which kept the vessel in the trough when it was anchored. Few calm days were experienced during the study period. Wave heights of 1 to 1.5 m were commonly encountered, and spade core sampling was discontinued when waves attained 1.5 m or more.

Currents

114. Currents are important factors in the dispersion of marine organisms. Organisms that spend their entire lives in the plankton are continually transported by currents, and the larval forms of fish and bottom invertebrates may spend days or weeks in the plankton. The upper waters, which enter the Gulf of Mexico via the Yucatan Channel, are derived principally from the North Equatorial Current, but contain a considerable admixture of water from the South Equatorial Current (Sverdrup, Johnson, and Fleming, 1942). Subtropical Underwater and Antarctic Intermediate water also enter the Gulf, contacting the continental shelf at 100 m and the continental slope at 500- to 700-m depths, respectively (Nowlin and McLellan, 1967).

115. Upon entering the Gulf, most of the water flows through the eastern Gulf and out the Straits of Florida as the Florida Current (Hurbertz, 1967; Nowlin and McLellan, 1967; Leipper, 1970). The location of the eastern Gulf, or Loop Current, is quite variable; Leipper (1970) found a significant seasonal and annual variation in areal extent. The Loop Current expands progressively into the Gulf beginning early in the year and may reach the region of the Mississippi Delta by late summer or fall. For more detailed discussions of this current, see Jones, O'Brien, and Hsueh (1973) and Maul (1974).

116. After flowing through the Straits of Yucatan, the current divides into northerly and westerly components. The westerly component flows eastward past the Gulf of Campeche and northward along the eastern Mexican coast. The northerly component flows toward the northern Gulf and divides into easterly (Loop Current) and westerly components. The westerly component flows along the Louisiana and Texas coasts, converging with the current flowing north along the Mexican coast (Curray, 1960; Nowlin, 1971). Mississippi River water entering the current regime may be carried with the Loop Current (Maul, 1974) or to the west, effecting a decrease in salinity along the Louisiana and Texas coasts (Temple et al., 1977).

117. The current regimes in the northwestern Gulf were described by Curray (1960), Kimsey and Temple (1962, 1963), SEADOCK (1975), and

NOAA Gulf Fisheries Center (1976). According to Curray (1960), the shelf currents along the Louisiana coast are to the west and the currents off the Rio Grande River are to the north throughout the year; windstress plays an important role in the direction of current flow off the central Texas coast only. In other, more localized studies off Padre Island (Watson and Behrens, 1970) and Port Aransas, Texas (Smith, 1975), local windstress was also cited as the primary driving force of nearshore surface currents.

118. Early in the year, from January through March, the currents along the Texas coast are westward to southwestward (alongshore) in response to easterly winds. The resultant winds shift gradually to the southeast or south-southeast. During the shift, the current undergoes a period of transition from March through May with no clearly defined north or south components. In June and July, the current flowing northward along the Mexican coast is strengthened by the southeasterly winds, pushing the area of convergence ahead of it to the northeast. Depending on conditions, the convergence ultimately intrudes northward to between Corpus Christi and Freeport, Texas. Because of the coastal configuration, currents in the Galveston area are onshore in August and may cause the "blue water" phenomenon; i.e., clear Gulf water is pushed in close to the shoreline where the water is normally quite turbid.

119. In September the winds become easterly and the convergence begins retreating along the coast as the westward flowing current increases in strength. The winds in October through December have an easterly to northeasterly component, which acts to drive the convergence southwestward to the vicinity of the Rio Grande River.

120. The existence of the convergence has been known for a long time. Sweitzer (1898) described it as an area of agitation of about 260 km^2 off Aransas Pass, Texas. It has been called the graveyard of ships (Leipper, 1954) and the Whirlpool of the Gulf (Curray, 1960).

121. Current meters were installed in the DMDS near the inshore margin (10-m depth) and near the offshore margin (15-m depth). Bouma et al. (1976) and Moherek (1976) described the results of these studies. The significant findings of these studies were that net current movement

was dominated by SW or SE vectors (alongshore or offshore) and that current reversals occurred periodically. Bouma et al. (1976) attributed the reversals to changes in tidal cycle conditions from diurnal to semidiurnal. Tidal flow in and out of Galveston Bay was considered to be the principal driving force of the observed currents; local windstress was considered negligible.

122. Instantaneous current profiles taken in the DMDS indicated that the current direction tended to rotate clockwise with depth and that the speed decreased with depth (Bouma et al., 1976). The data indicated that bottom currents of 0.1 to 0.2 m/sec were common, but that under proper conditions of wind and tide flow, currents on the order of 0.5 m/sec occurred.

123. Sundborg (1956) calculated that a current speed of 0.35 m/sec at 1 m above the bottom was required to pick up and move fine quartz sand, although once in motion, a lower current speed would keep the sand in motion. These conditions are met part of the time as shown by sediment tracer studies conducted by Hall (1976) in the vicinity of the northern corner of the DMDS.

124. The field crews observed very strong currents on several occasions during coring operations. During these periods, difficulty was encountered in getting the spade corer to trigger because the current was causing it to land in an unstable position and fall over.

Tides

125. The Gulf of Mexico experiences three basic types of tides, viz: diurnal, semidiurnal, and mixed, with the diurnal component being the largest. The mixed tide is separated into mixed diurnal and mixed semidiurnal, depending on the harmonic components. The south jetty experiences a mixed diurnal tide in which there are "more days of the occurrence of two high waters and two low waters each fortnight near the times of the moon's crossing of the equator in the years of minimum inclination of the moon's orbit" (Marmer, 1954). In practice, the tides at the entrance channel are semidiurnal during equatorial tides and diurnal during tropic tides (moon at maximum declination north or south of the equator).

126. The tidal range is small, usually less than 30 to 60 cm. Occasionally, strong winds combined with spring tidal conditions produce water levels up to 90 cm above or below normal (SEADOCK, 1975; Bouma et al., 1976).

Infrequently Occurring Abiotic Events That are Likely to Adversely Affect the Biota of the Study Area

Floods and drouths

127. During very high freshwater discharge, Galveston Bay and part of the nearshore area can be rendered essentially fresh; the minimum salinity recorded by the National Ocean Survey in the Galveston Channel was 0.4 ppt in November 1960. Very low salinities can effect drastic changes in the benthic populations and cause a migration of nektonic forms into more saline waters as documented by Harper and Hopkins (1976) in San Antonio Bay. During periods of low freshwater discharge, saline water will invade much of the Galveston Bay complex. Salinities in the low- to mid-20 ppt range recently have been recorded in Trinity Bay (Mackin, 1971) and upper Galveston Bay (Gillard, 1974). It is probable that during the "seven-year drouth," much of the Galveston Bay area and most certainly the area of the DMDS had oceanic salinities part of the time. During periods of low freshwater discharge, high salinity fauna and flora fill the ecological niches vacated by the less tolerant biota (Parker, 1955). When estuarine salinity conditions are reestablished, the high salinity fauna are killed as was documented by Hoese (1960) in Mesquite Bay, Texas.

Severely cold air temperatures

128. A factor in the survival or death of marine biota in the vicinity of Galveston (and the entire Gulf coast) is the passage of cold fronts or cold waves ("northers"). An especially severe cold front ("blue norther") following a period of mild temperatures can cause extensive mortalities among poikilotherm (cold-blooded) fish and invertebrates and thus cause a considerable reduction in the biomass of the area.

129. Severe cold spells cause mortalities of fish and invertebrates every few years. Reports of such mortalities along the Gulf coast prior to 1940 have been made by Willcox (1887), Bangs (1895), Finch (1917), Storey and Gudger (1936), and Storey (1937). There are no written records of such mortalities on the Texas coast prior to a 1940 cold wave, but oral reports to Gordon Gunter (1941) by Texas Game, Fish, and Oyster Commission personnel indicated that freezes in 1917 and 1924 were very destructive to fish in Texas. There were also very severe freezes in 1886 and 1899 that probably caused extensive mortalities. The lowest air temperature ever recorded at Galveston was -13°C in 1899 (Gunter, 1941).

130. According to Gunter (1945), the Texas coast experienced a hard cold spell every 14 years on the average between 1856 and 1940. Less damaging cold spells occurred at more frequent intervals. Since 1940, severe cold fronts that did considerable damage to marine life have occurred in 1947 (Baughman, 1947; Gunter, 1947a) and in 1951 (Gunter and Hildebrand, 1951). Less severe mortalities have occurred in 1941 (Gunter and Hildebrand, 1951), 1942 (Gunter, 1945; 1947b), and 1949 (Gunter and Hildebrand, 1951).

131. The lowest temperature attained during a cold wave apparently is not the most destructive factor. The coldest temperatures during the cold wave of 1951 were lower than the 1940 temperatures, but mortalities were less in 1951. The severity of the effect appears to be dependent on the rapidity of the temperature drop (Story and Gudger, 1936; Gunter, 1945; Gunter and Hildebrand, 1951) and, to an extent, the size of wind-generated waves that disturb the bottom. The 1940 cold front was the first hard one of the year and the temperature fell rapidly; at Port Aransas, Texas, 290 km southwest of Galveston, the air temperature fell from 18 to -4°C in 4 hours. The lowest water temperature recorded was 4°C. Ice formed along the margins of the bays. The mortality rate was catastrophic. In contrast, the cold spell of 1951 came on gradually and was preceded by lesser cold fronts. At Port Aransas, even though the air and water temperatures fell to -8 and 3°C, respectively, the mortalities were less (Gunter and Hildebrand, 1951).

132. It is probable that events prior to and during the 1951 cold wave caused fish to move to deeper water or allowed them to acclimate before the extreme cold occurred. A Texas Game, Fish, and Oyster Commission official observed tons of numbed fish being swept out of San Luis Pass (at the southwest end of Galveston Island) during the 1940 freeze, but because few fishes were found on the beaches, he believed they revived in the warmer waters of the Gulf (Gunter, 1941). Gunter (1945) showed that fish migrate out of the bays with the onset of cooler temperatures of the fall. Thus, it is probable that if the temperature decreases gradually, the fish have the opportunity to migrate to deeper Gulf waters; severe mortalities are caused when the fish are not forewarned.

133. Storey (1937) postulated that fish with tropical distribution were killed most extensively during cold waves; Gunter (1941) and Gunter and Hildebrand (1951) concurred. It has also been observed that the young of cold-blooded marine species survive cold spells better than mature specimens (Hildebrand and Cable, 1930; Gunter, 1938, 1941, 1945, 1947b). Gunter (1941) showed that after the 1940 cold spell, there was a decline in the catch of finfish, but shrimp catches did not seem to be affected.

134. Most of the accounts of cold-induced mortalities have dealt primarily with spectacular fish kills in the bay systems of the Texas coast. Gunter (1941) did note that after the 1940 cold wave thousands of clams, gastropods, and starfish were washed ashore at Port Aransas. He believed that these invertebrates were cold numbed and failed to maintain their position in the substrate. Gunter (1947a) stated that the effects of freezes and cold waves seem to be less severe on invertebrates than fish. The deaths are perhaps less noticeable and less spectacular because the invertebrates do not float when they die.

135. Along the Galveston shores, there have been major invertebrate mortalities following the less severe cold waves if a heavy surf was produced by the accompanying wind. As Gunter (1941) suggested, the invertebrates, numbed by the cold, were probably not able to maintain their position in or on the bottom when dislodged by the turbulence and

were cast on shore. During the Groundhog Day kill of 2 February 1966, thousands of *Dinocardium robustum* (cockles), *Dosinia discus* (disk shells), *Pinna serrata*, and *Atrina rigida* (pen shells) and numerous crabs were stranded on Galveston beaches. Many were not yet dead when found (personal communication, 1966, Harold W. Harry, Biology Department, Texas A&M University). The Texas A&M Marine Laboratory at one time had a 10-gal trash can full of *Dinocardium* shells that were collected during this kill.

136. In January 1973, numerous *Tellina* spp. (tellin clams), *Polinices duplicatus* (moon snail), *Pinna*, *Atrina*, and *Dinocardium* were cast on the beach (personal communication, 1976, Selma Snider, Wayne Cotter, Texas A&M Marine Laboratory). On 25 December 1973, a very cold windy day, numerous *Dinocardium*, *Polinices*, and *Busycon contrarium* (lightening whelk) were found on the beach (personal communication, 1976, E. A. McEldowney, Galveston).

137. As noted above, these examples were spectacular because large colorful shells washed ashore that made the shell-collecting residents jubilant. Still unknown is the effect of cold waves and water turbulence on the smaller infaunal organisms. No information could be found on the effect of these combined factors on the offshore infauna. The infaunal populations of San Antonio Bay did not seem to be affected by the January 1973 cold wave (Harper and Hopkins, 1976).

Hurricanes

138. The following data were compiled by Henry, Driscoll, and McCormack (1975). On the average, one tropical storm or hurricane occurs somewhere each year. This statistic has little meaning when applied to a given year because there was no storm activity reported during half of the years between 1871 and 1974, and no activity at all between 1903 and 1908. During any given year, based on data from 1871 through 1974, there is a 32% probability that the Galveston area will experience a storm of at least tropical storm intensity, an 18% probability of a hurricane, and a 7% probability of an extreme hurricane.

139. On the average, the Texas coast experiences a hurricane every other year and a tropical storm every third year. The Galveston

area is hit by a storm of at least tropical storm intensity every 4 years, a hurricane every 5 years, and an extreme hurricane every 19 years. Four percent of the time, Galveston will experience two or more storms in one year.

140. The intense wave action associated with hurricanes is an important agent in reworking the sediments on the entire shelf. Sediments on the edge of the shelf are stirred by hurricanes approximately once every five years and on the rest of the shelf more frequently than once every two years (Curray, 1960).

141. Hurricanes can produce storm surges up to 6 m in height. The highest surge occurs in the right front quadrant where the onshore winds are highest. Water piled up in the bays by winds rushes back to sea when the wind pressure decreases, causing scouring of existing channels, the opening of new channels, and the transporting of large quantities of sediment into the Gulf.

142. The total rainfall from a hurricane is quite variable, but the largest amount is generally produced by a large, slowly moving storm. The rain may cause flash floods or river system floods. The resultant decrease in salinity can cause mass mortalities among estuarine and nearshore dwelling organisms.

PART IV: GENERAL FIELD AND LAB METHODS

Field Equipment and Methods

143. The purpose of this section is to describe the equipment and sampling techniques used in the field as well as the laboratory techniques employed, thus avoiding duplication in the separate sections dealing with the pilot and monitoring studies.

Navigation

144. The first cruises during the pilot study were made by geological oceanographers of Texas A&M University to conduct bathymetric and subbottom profiling studies. Vessel positioning was accomplished by a LORAC system.

145. During the biological surveys, the expensive LORAC system was not used. Of the myriad problems inherent in a coastal marine study, one of the greatest is acquiring a vessel that will be on standby, ready to go as soon as the weather improves enough to conduct sampling operations, or to be available whenever special cruises need to be made on short notice. While it would be advantageous to have radar or other sophisticated electronic positioning systems aboard, they are not always available. Most vessels are equipped with LORAN A receivers, but it has been the author's experience that one or both LORAN stations are inoperative as often as the system is operational. LORAN would have been of dubious value in this study because of the proximity of the dredged material disposal site to the LORAN towers at Galveston and because LORAN has an accuracy of ± 0.8 km--the length of each side of the study units (blocks) in the DMDS. The WES purchased a microwave positioning system that was intended to give precise station locations. However, the unit, which worked perfectly on the ground, usually failed to work when mounted and never worked while a biological cruise was in progress.

146. On the few days during April and May 1975, when Galveston experienced clear weather and calm seas, compass sightings were used to position the vessel. When Galveston was obscured by haze or fog, sta-

tion locations were determined by running times along a set compass course. The captain would stop at the sea buoy and allow the vessel to drift for 5 to 10 min. He would then note the time and direction of the run back to the sea buoy. This maneuver allowed him to make allowances for the speed and direction of wind and currents when calculating the running time from the sea buoy to the desired sampling location. Obviously this system has its drawbacks, and the resulting ship station locations are open to question. This represents, however, one of the intangibles of marine operations. A good captain, who knows his vessel and the area in which he is working, may be very accurate at locating his vessel in a desired location. This method is at least as reliable and accurate as electronic positioning systems that work part of the time or not at all. In the author's judgement, most, if not all, samples were collected from within the appropriate site even though the exact location cannot be precisely fixed.

147. The predisposal collections were made in July 1975. The same navigation methods were used during these cruises as were used during the pilot study. The same captain and vessel were used for this phase of the study and error in station locations is probably consistent with that occurring during the pilot study. Prior to commencement of maintenance dredging, which began on 24 August 1975, WES personnel contracted with the U. S. Coast Guard, Galveston, to place four buoys in the study area. Buoy A, off the end of the north jetty, was to aid in the collection of current data. Buoys B, C, and D were to be placed in experimental blocks 2, 12, and 14 in the DMDS, respectively (refer to Part VII for locations). During the September cruise and all subsequent cruises, station positioning in the experimental blocks was simply a matter of stationing the vessel at given distances and directions from the buoys.

148. The sampling locations in the control blocks were determined by navigation sightings on ship channel buoys and landmarks. The services of another vessel were used for the September and all subsequent cruises, but the new captain had assisted in the navigation during the previous cruises and knew the area well. Although some station posi-

tioning error may have occurred, errors are believed to be minimal.

Macrobenthos

149. General. All benthic samples were obtained while the vessel was anchored. A spade corer was used at all times except for January samples collected at station 12-3 when a van Veen grab was used. The core box of the spade corer measured 29.8 cm long × 21.0 cm wide and sampled an area of 625.8 cm^2. The corer could penetrate a maximum of 44 cm into the substrate. In soft mud the corer usually penetrated its full 44 cm, but on hard sand, penetration was as little as 5 cm.

150. When the spade corer was placed on deck, the spade was pulled back and the sample was dropped into a washing box equipped with a spout. The sample was stirred manually and by water from a deck hose to break up the sediment and was then poured onto a sieve (1.0-mm mesh during the pilot study, 0.5-mm mesh during the monitoring study). All animals and shell hash retained on the sieve were placed in containers; magnesium sulfate was added to relax the organisms. After thirty min the samples were preserved in 5% seawater formalin.

151. Pilot study. During the pilot study two replicate samples were collected from each station. These were used to determine the areal distribution of the macrobenthic organisms. While on station, sediment samples were also collected, which were sent to Dr. G. Fred Lee and Arnold Bouma for sediment chemistry analyses and grain-size analyses, respectively.

152. At three of the stations, 10 replicate samples were collected to provide an estimate of faunal variability and to permit determination of the optimum number of replicates necessary to adequately sample the macrobenthic populations.

153. Experimental study. The macrobenthos were sampled bimonthly. Five replicate spade core samples were collected from each station in the manner previously described.

Meiobenthos

154. Experimental study. Meiobenthic samples were not taken during the pilot study. During the monitoring study, one meiofaunal sample was taken, when possible, from each macrofaunal sample obtained

with the spade corer. If the sediment emerged from the core box intact and upright, a meiofaunal sample was extracted by pushing a 4.88-cm-diameter (18.7 cm^2) plastic tube 4 cm into the upper sediments. This sample was preserved intact in 5% seawater formalin.

155. When the core box penetrated to less than half its depth, the box wall friction on the sample was not sufficient to allow it to slide out slowly after the spade was pulled back. The sample often flipped as it dropped into the box, obliterating the upper few millimetres of fine sediment where much of the meiofauna resides. It was not practical to obtain a sample under these conditions. The sample was often stabilized manually as it emerged, but it was not possible to obtain an undisturbed sample at all times. It was not practical to resample each time a sample flipped over during core extraction because as many as 20 to 30 box core drops might have been required to obtain five intact cores--costly in terms of time, money, and crew morale.

156. Meiobenthic samples were collected in July, September, and November only. This portion of the study was halted because of lack of funds.

Nekton

157. General. Nektonic and macro-epibenthic animals were sampled with a 3-m otter trawl having 2.5-cm stretch mesh. The doors of the trawl were set so the tickler chain and lead line dug into the upper sediment and collected macro-epibenthic organisms. Tows were for five min with tow time beginning when the winch drum was stopped and locked. Whenever possible, the organisms were counted and measured in the field; all collected samples were placed in 5% seawater formalin solution.

158. Pilot study. Sampling was accomplished on 12 and 14 May 1975. Two replicate trawls were made at each location.

159. Experimental study. Three trawls were made bimonthly at each location during the entire period of the experimental study.

160. For stomach content analysis, 10 specimens of fish were selected and gut-injected with 70% formalin. Selection was based on the number of species collected and the number of possible feeding types. Up to five specimens of a given species were kept for gut analysis.

Zooplankton

161. General. The same techniques were used in both the pilot and experimental studies. A one-half-m 243 μ plankton net, equipped with a digital flowmeter at the mouth of the net, was used to collect zooplankton samples. Oblique tows were made by allowing the net to sink to the bottom, then pulling it slowly to the surface while the boat moved ahead at slow throttle. Two replicate tows, each requiring 5 to 7 min, were made at each station. The samples were preserved in 5% buffered seawater formalin. The flowmeter readings prior to and after the tow were used to calculate the volume of water filtered. The flowmeter was calibrated prior to the study; after four months's use, it was found to be within the manufacturer's specifications.

162. Archival zooplankton samples were obtained from the NMFS, Galveston. Between 1963 and 1965, personnel of the Galveston Laboratory of the NMFS conducted an intensive survey of the waters over the continental shelf of the northwestern Gulf of Mexico. This survey, designed primarily to provide information on shrimp and finfish, also provided extensive hydrographic information (see Part III, temperature and salinity) and zooplankton data. NMFS station W55 (location previously described) was close to the DMDS. Samples were collected at approximately monthly intervals between 11 March 1963 and 2 June 1965 with a Gulf V plankton sampler (Arnold, 1959). Step oblique tows were made commencing 3 m from the bottom and terminating 3 m from the surface. Samples, preserved in 10% formalin aboard ship, were reduced and stored in 5% buffered formalin in the laboratory. A flowmeter in the mouth of the net was used to calculate the volume of water filtered.

Phytoplankton

163. Pilot study. During the pilot study phytoplankton samples were taken by pumping water into 3-ℓ containers from one m below the surface, from mid-depth, and from one m above the bottom. Samples were collected from five discrete locations in each half of the DMDS along the course taken during the zooplankton tow. The samples were stored in darkness pending analysis.

164. Experimental study. The pumping method was unsatisfactory

for collecting phytoplankton samples. Suspended sediment in the water apparently disrupted the phytoplankton cells as they passed through the pump impeller, because few intact cells were found when the samples were concentrated and examined. During the experimental study, phytoplankton samples were collected with 3-ℓ van Dorn water bottles. As before, two replicates were taken at near surface and near bottom at each station (except during some experimental studies). The samples were kept in subdued light until transported to the laboratory.

Laboratory Methods

Macrobenthos

165. Each macrobenthic sample was washed with fresh water to remove formalin and as much of the remaining sediments as possible. The lighter organisms were removed by repeated decanting and were preserved in 70% ethanol. The remaining shell hash and heavier organisms were preserved in 70% ethanol to which rose Bengal stain had been added. After at least 24 hr had elapsed, the shell hash was examined microscopically and all remaining specimens were removed and combined with the decanted organisms. The macrobenthic organisms were identified to the lowest possible taxon, assigned to either young or adult categories, counted, and stored in 70% ethanol for future reference.

Meiobenthos

166. Samples were washed with fresh water on a 500 μ sieve and a 62 μ sieve. The former removes shell hash and macrobenthic organisms. The latter separates the silt-clay sediment fractions. The material remaining on the 62 μ sieve was washed in 70% ethanol and stained with rose Bengal stain. After at least 24 hr, the sample was shaken and allowed to settle for two to three days. An aliquot was taken by removing a core using a 9-mm-diameter (0.636 cm^2) glass tube. The contents of the core were spread on a dish and examined microscopically. All organisms were removed, identified to the lowest possible taxonomic rank, and counted. If few organisms were encountered, a second or third aliquot was removed and similarly examined.

Nekton

167. Collected specimens were washed in fresh water, identified, measured, and counted. Wet weight biomass was determined for the sample as a whole after which the specimens were discarded. A typographical error in the scope of work for the first contract led the field crews to record lengths in 10-cm size classes instead of 1.0-cm size classes during the pilot study and first experimental study collection. Thereafter lengths were measured in 5.0-cm size classes.

168. The stomachs and intestines of the gut-injected fish were removed and opened. The contents were washed into a dish, examined, and categorized. If species or higher taxa were recognized, they were counted. Otherwise the material was classed as percent detritus or animal remains.

Zooplankton

169. In the laboratory, samples were halved using standard techniques employed with the use of a Folsom plankton splitter. One-half was saved for the archives; the other half was analyzed.

170. Standing crop estimates, plus estimates of the abundance of individual zooplankton taxa, were determined by a three-step process. First, a small fraction of the sample (about 1/100th) was examined microscopically at 25X, and each organism in the fraction was identified to the lowest taxon possible (often to genus and species) and counted. This fraction had to yield 300 or more of the most common taxon or additional fractions were similarly examined until 300 was surpassed. To obtain the small fraction (aliquot), the analysis half of the sample was diluted with 5% formalin to a volume of 900 ml. A Stempel pipette of 5-ml capacity was then used to extract the aliquot from the 900-ml sample that had been thoroughly mixed.

171. In the second step, two to five additional aliquots were similarly examined to gain better estimates of the rarer taxa found during the first step and also to find additional rare organisms--especially the small ones. During this second step, none of the dominant (most abundant) taxa were counted, and their densities were based solely on the counts obtained in step one.

172. The third and final step was an examination of a much larger portion of the sample--sometimes the entire remainder of the half sample, but usually one-half of it (i.e. approximately one-quarter of the entire sample). This was examined at 12X for larger, less abundant zooplankters that were not commonly found in the earlier steps or were altogether new. Fractions of the sample--with enough plankton to cover most of the dish's bottom--were examined at one time, until the whole portion had been examined.

173. The number of individuals of each rare taxon found during the initial step was added with those found during the second step. This sum was the basis for densities of the small rare forms. If the counts were still low for the larger rare forms, the counts from the final examination were also added. Small organisms were usually not counted during the final step because of the probability of overlooking them. To determine densities ($\#/m^3$) for the various taxa, each taxon's count was multiplied by appropriate extrapolation factors according to which step in the analysis held the final count for the taxon.

174. The volume of the sample was determined using a filtration-displacement method. One-eighth of the entire sample was placed in a filtration crucible and the fluid drawn off by vacuum. The crucible containing the plankton was then filled and the volume of the plankton was determined. This number, multiplied by eight and divided by the number of cubic metres filtered during the tow, determined the volume of zooplankton per cubic metre of water.

Phytoplankton

175. One to two ℓ of each phytoplankton sample were used for pigment analysis. Pigment analyses followed the fluorometric methods of Strickland and Parsons (1963), based on the method of Yentsch and Menzel (1963) with one major modification--overnight extraction was replaced by employing a tissue grinder. The water sample was filtered on a millipore filter (0.45 μ) at one-third atmosphere. When the filters were thoroughly drained, they were placed in covered plastic containers and frozen in a dark box pending analysis. In many instances, the sediment volume was so great that the filters became clogged, and it was nec-

essary to use two or three filter pads.

176. To extract the pigments, the filter pad(s) was folded, placed in the tissue grinder with two ml of 90% acetone, and ground for one min or until the pad had completely disintegrated. The suspension was transferred to centrifuge tubes by washing the grinder with small amounts of 90% acetone. The final volume in the tube was brought to 10 ml with 90% acetone. The tubes were covered and centrifuged at 3000 to 4000 rpm (about 2000 G) for 3 min. The tubes were removed, shaken vigorously, and recentrifuged at 2000 to 3000 rpm (about 1500 G) for one min. The tubes were allowed to sit for 10 min after the second centrifugation. The supernatant was decanted into a fluorometer cuvette and the extinction value was measured. The fluorometer was zeroed with 90% acetone prior to analyzing the sample and at frequent intervals during analysis. Two drops of 1N HCl were added to the sample cuvette and the extinction value was again measured. The calculations for chlorophyll-*a* and phaeo-pigments are as follows (Lorenzen, 1966):

$$\text{Chlorophyll-}a\ (\text{mg/m}^3) = \frac{\frac{t}{t-1}(K_x)(F_o - F_a)}{\text{liters filtered}} \times \frac{1}{\substack{\text{dilution} \\ \text{(if necessary)}}}$$

$$\text{Phaeo}\ (\text{mg/m}^3) = \frac{\frac{t}{t-1}(K_x)\left[(F_o/F_a \times F_a) - F_o\right]}{\text{liters filtered}} \times \frac{1}{\substack{\text{dilution} \\ \text{(if necessary)}}}$$

where:

F_o = fluorescence before acidification

F_a = fluorescence after acidification

t = 2.2

K_x = calibration factors of specific slit width

PART V: ANALYSIS OF DATA

Macrobenthos

177. The spade corer sampled one-sixteenth of a square metre. Numbers of macrobenthic individuals per m^2 were therefore calculated by multiplying the raw data by a factor of 16. These extrapolated data were used in all subsequent analysis.

178. The data were first examined in a descriptive manner, comparing trends in the numbers of individuals and the numbers of species at stations within each block through time. These data were compared with substrate descriptions and with the volume of collected shell hash. For the January, March, and May data, correlation coefficients were calculated for macrofauna vs. sediments (mean grain size, Ø units).

179. The data were then subjected to numerical analysis following the methods of Smith (1976; personal communication, 1977, University of Southern California). The following is an attempt to explain the various procedures used in the analysis of data. It is not meant to be detailed because it is quite easy to become lost in the mathematics necessary to the procedures. The reader interested in more detailed explanations is referred to the recent works of Clifford and Stephenson (1976) and Smith (1976); both contain excellent summaries of the literature.

Data reduction

180. The computer analysis of data seeks patterns of co-occurrence of species. Species that occur infrequently contribute little, if anything, to the patterns and may add "noise" to the analysis. Infrequently occurring species were eliminated prior to classification. To accomplish this, the species in each data lot were ranked by the number of stations at which they occurred. The cutoff point for infrequently occurring species varied from analysis to analysis, but was usually at the level of 4 or 5 occurrences. The ranking program also calculated the cumulative percentage of individuals accounted for by each successively ranked species. The percentage figures were used to

ascertain that the information loss at the cutoff point was held to 4% or less. Species of questionable identification above the cutoff limit were also deleted. Species below the cutoff point with more than an average of 100 individuals/m^2 were retained.

Classification

181. Classification is an attempt to display, in two dimensions, an array of points in n-dimensional space. In the classification procedure utilized with the biological data, the data were assembled in a data matrix (not be to confused with a distance matrix) of sites vs. species; each site is considered an entity and the species present at that site are the attributes. If the attributes and the numbers of each attribute are similar at two entities (sites), the ecological distance between the entities will be small. Conversely, the fewer the similar attributes, the greater the ecological distance between entities. A distance measure is used to calculate the ecological distance between all possible pairs of stations, and the distances are inserted in a distance matrix.

182. In the clustering procedure, a dendrogram is produced that is a two-dimensional display of the ecological distance between entities. The pair of entities with the shortest ecological distance in the distance matrix is chosen first and the two entities are fused into a single group. This procedure is represented graphically on a dendrogram by joining the two sites with lines, the height of the lines being a measure of the percent dissimilarity (ecological distance) between the two sites. Other sites are added to the dendrogram sequentially, based on the ecological distance between the site being added and the sites already clustered. The sorting method varies with the sorting strategy; in this study flexible sorting was chosen because it portrays distinct clusters that facilitate interpretations.

183. The above method of classifying stations based on the co-occurrence of species at pairs of stations is known as normal analysis. The second step in classification is known as inverse analysis. The sites vs. species matrix is switched so the species are now entities and the sites are attributes. A distance matrix based on the co-occurrences

of attributes is executed. The data are clustered, as above, and a dendrogram representing the ecological distance between species is produced.

184. In summary, the above procedure is based on species overlap, i.e., the degree to which the species in question share the same habitat at the same time. Normal, or site analysis, is based on the species common to pairs of sites and inverse analysis is based on the sites common to pairs of species.

185. Following the execution of the dendrograms, a two-way table is constructed. This table lists the sites in order of their occurrence on the site group dendrogram and the species in order of their occurrence on the species group dendrogram. The actual numbers of individuals of each species may be inserted in the two-way table, or the relative abundance may be represented symbolically. The two-way table facilitates the determination of the interrelationship between the sites and species.

186. Classification was first performed on the bimonthly data using each replicate as an entity. The replicates at each station were then summed and averaged and another analysis was perfomed. Finally, the summed bimonthly data were concatenated serially and analyses were run at selected stages. Thus there are analyses for each bimonthly collection (all six collections) both summed and unsummed, all post-disposal collections (November-May) summed, the three months for which concomitantly collected sediment data were available (January, March, and May) summed, and two subunits of the postdisposal data (November-January and March-May) summed.

187. Prior to classification, the data were transformed and standardized. In most cases, a benthic sample will contain a few numerically dominant species and many species having small numbers of individuals. Most of the distance measures are sensitive to the magnitude of the data values; untransformed data is strongly biased by the few numerical dominants that may disproportionately dominate the analysis. Potentially valuable information contributed by the other species can be lost. To reduce this dominance, the values of the large numbers

can be reduced by a transformation. Log transformations have been tried and rejected by the author because they tended to eliminate the differences between dissimilar site groups. A cube root transformation was used in the analysis of the pilot study data because of the large populations of hemichordates. For the analysis of the experimental data, a relatively mild square root transformation was used in conjunction with the standardization procedure (described below).

188. Theoretically, the population size of a species along an environmental gradient follows a bell-shaped curve. Undersampling one part of the gradient will result in a peakedness (kurtosis) of the curve that departs from the true peakedness. To reduce the unevenness of the sampling pattern along the curve, the sites in the undersampled (the undersampled sites are separated by more ecological distance than the less unique sites) part of the curve are weighted by assuming that there are more such sites than were actually sampled, thereby reducing the uniqueness of the unique sites. For normal analysis, a distance matrix is calculated based on unweighted species mean standardized data. From these data a set of weights is calculated. The weights are used for a recalculation of the distance matrix from weighted species mean standardized data. The weights are then recalculated from the new distance matrix. This procedure is repeated until the weights from successive iterations converge. For inverse analysis a weighted species maximum standardization was used.

189. Following the transformation and standardization, Bray Curtis classification and flexible sorting were used to produce the dendrograms and two-way tables. The Bray Curtis distance measure is a single quotient derived from comparison of species and numbers of individuals at any two pairs of stations. Unlike the Euclidean distance measure (see below), the Bray Curtis measure is not affected by double zero comparisons (lack of a species at both stations being compared); this is vitally important in the classification of biological data where numerous zeros usually occur in a matrix, even after elimination of rare species. The Bray Curtis measure is affected by dominance and the influence of attributes can be controlled by transformation and stand-

able and each of the remaining rows was made the independent variable in n_{row}-1 separate regression equations. The equations were used to predict the missing data values. For each missing data value, $n_{row}-n_{msg}$ (where n_{msg} is the number of missing data values in the column under consideration) separate estimates were made. The estimates were averaged to give a final estimate that was inserted in the matrix in place of the missing value.

194. Following the insertion of estimated data points, the variables were placed in a histogram to determine the amount of skewness. Skewed data were transformed with a $\sqrt[n]{\ }$ or a log transformation.

195. Prior to classification, the data were centered by attribute mean and standardized by attribute standard deviation for both normal and inverse analysis. Abiotic variables are usually on different scales, causing the distances to be influenced by the scale. Centering removes the effect of scale separation. Standardization by the attribute standard deviation gives each abiotic variable equal variability.

196. Classification was by the Euclidean distance measure with flexible sorting. Euclidean distance is the distance between points in a Cartesian coordinate system. In normal analysis, each dimension of the coordinate system corresponds to an abiotic variable and the points in space represent sites. In inverse analysis, the abiotics and sites are reversed. The measure has been found sensitive to the magnitude of the difference between abiotics. Transformation and standardization were applied to prevent dominance by attributes with large differences between sites.

197. Euclidean distance was not used in classification of biological data because it is sensitive to double zeros: two sites lacking many of the same species will be found in the same vicinity in Euclidean space and thus be separated by relatively short ecological distance without regard for the cause of the lack of species. Abiotic data usually have some value greater than zero and hence are not subjected to the double zero problem.

Principal components analysis

198. Principal components analysis (PCA) is the ordination of

Euclidean distances between entities. Instead of a distance matrix, the initial input of data is a correlation matrix. Transformed abiotic data are centered and standardized by attribute standard deviation. The PCA graphic display includes plots similar to the plots produced by ordination. PCA was limited to the pilot study data because too few abiotic data were available from the experimental study.

Statistical analysis

199. The use of statistical techniques was somewhat limited by the nature of the study. In the usual course of a project, data are gathered on the areal and seasonal variability of the populations. A hypothesis on the effects of an impact, such as dredged material disposal on the populations, is developed and the hypothesis is tested. On this project, an insufficient amount of baseline data was collected to propose a hypothesis. Because of the wide variability in numbers of individuals between many replicate samples, it was expected that the statistical significance that could be attributed to the data would be minimal.

200. Statistical analyses performed on the benthic data included correlation coefficients calculated between sediments and macrobenthic data and analyses of variance (ANOVA) comparing numbers of individuals by months for each block and numbers of individuals by station for each block.

201. The correlation coefficients were calculated between available sediment grain-size data (see Scrudato and Estes, 1977, for raw data) and the macrobenthic populations and diversities. Sediment data used in the calculations included mean grain size, percent sand, percent silt, and percent clay, and with and without arcsine square root transformation. The coefficients were calculated for all replicates in a block and all replicates in a month and for averaged data per station per month.

Meiobenthos

202. The core tube used to extract a meiofaunal subsample from

each spade core sample had a cross-section area of 18,727 cm^2. Thus the number of individuals in each aliquot were first multiplied by the size of the aliquot and then by 534 to calculate the number of individuals per m^2.

203. The sampling problems encountered in the field created numerous blanks in the data matrix, and it was not possible to determine temporal population changes or to do a numerical classification on the data. Data analyses were confined to calculating correlation coefficients between meio- and macrofaunal populations to determine if there were any relationships between the two populations.

Nekton and Benthic Macroinvertebrates

204. The trawled organisms were separated into three components, viz: macroepibenthos, nektonic invertebrates, and vertebrates. The data were examined descriptively, comparing trends in the numbers of individuals in each component at each station through time. The total data (6 collections) were classified using a Bray Curtis dissimilarity measure, square root transformation, and flexible sorting with 49 species. The fish stomach content data were also examined descriptively.

205. Analysis of variance was performed comparing total numbers of individuals by month and by station.

Zooplankton

206. The densities of zooplanktonic organisms per m^3 of water were calculated by first multiplying the numbers counted by the aliquot size to give the number per sample, then dividing by the number of m^3 of water filtered.

207. The data were examined descriptively, comparing temporal holo- and meroplanktonic population trends. The temporal trends of selected members of the meroplankton were also examined. The Texas City dredged material disposal data were examined by comparing percentages of

various taxa before, during, and after disposal.

Phytoplankton

208. Phytoplankton pigment concentrations in the ship channel and in the disposal area were compared descriptively, as were data collected during the Texas City dredged material disposal. The analyses were limited because so few data were collected.

PART VI: THE PILOT STUDY

209. As previously mentioned, the pilot study was designed to be a short-term intensive survey of the biological and abiotic characteristics of the DMDS and surrounding area. This portion of the study was planned to be completed in two to three weeks. It actually required almost two months, from 1 April through 28 May 1975. The weather of the spring of 1975 was very poor, with numerous squalls, persistent northeasterly winds, rough seas, and frequent haze or fog. The geological oceanographers' fieldwork required two weeks and biological fieldwork required five weeks. The result of the protracted fieldwork was to throw the entire data analysis and reporting timetable off schedule.

Study Design

210. The DMDS was divided into a grid containing 28 equal subunits, called blocks, each 0.8 km on a side and having an area of 0.64 km^2. Because of the oblique northwestern boundary of the DMDS, it was necessary to make the pilot study area slightly larger than the DMDS proper. The blocks were numbered sequentially from northwest to southeast, hence there were four rows of seven columns (Figure 22).

Benthos

211. Two macrobenthic samples were taken from within each block in the manner previously described. The stations from which 10 replicate samples were collected were 6, 17, and 21 (Figure 23).

Nekton

212. Trawl samples were collected after the spade coring had been completed and investigators had the opportunity to observe the sediment characteristics in the DMDS. Nine trawl stations were established representing different combinations of depth and substrate (Figure 23). Two replicate trawl collections were made at each station.

Zooplankton

213. The DMDS was divided into inshore and offshore halves. Two replicate zooplankton tows were made diagonally across each section.

The second tow course retraced the first tow course in each section.

Phytoplankton

214. During the pilot study, phytoplankton samples were pumped into 3 ℓ containers from the surface, mid-depth, and bottom of the water column. Samples were collected from 5 discrete locations in each half of the DMDS, along the course taken during the zooplankton tow. As mentioned in the general field methods section (Part IV), apparently the sediment in the water column combined with the action of the pump impeller to destroy the phytoplankton cells. No analyses except for a rapid visual inspection of each sample were performed.

Results

Analysis of benthic samples

215. Ninety-four species of benthic organisms were collected during the pilot study (Table B1). Polychaetes were the dominant taxon with 47 species. The data from each station are contained in Appendix B. It should be noted that there was often a considerable dissimilarity between the species and/or numbers of individuals collected in the two replicate samples at a given station.

216. In terms of simple numerical dominance, the benthos were dominated by the hemichordate (*Balanoglossus* sp.) population; of the 6363 organisms collected during the pilot study, 3849 (60.5%) were hemichordates. The total number of hemichordates collected was over an order of magnitude larger than the second-ranked numerically dominant organism, *Phoronis architecta,* of which 345 were collected. *Balanoglossus* was the dominant organism at 15 of the 28 stations, most of them in the offshore portion of the DMDS (Figure 24). In most cases, benthic samples will have a few species with large populations and many species with small numbers of individuals. If the species are ranked by decreasing numbers of individuals, a graph of the population usually resembles a logarithmic curve. In many of the pilot study samples, however, there was a precipitous drop between species 1 and 2 before the curve approached logarithmicity. These populations were the most un-

usual ever encountered by the author.

217. The inshore group of stations had various dominants. *Phoronis architecta* was the dominant species at four stations and the polychaete *Prionospio pinnata*, at three. Four stations--2, 11, 17, and 18--had no species that was particularly dominant. Figure 24 also lists the percentage of the total population comprised by the dominant species. At most of the inshore stations the dominant species amounted to less than 50% of the population. Among the offshore stations, the dominant organisms usually accounted for more than 50% of the population. The percent compositions of the various taxa are listed in Table 5.

218. Figures 25 and 26 depict the total number of species and average number of individuals per m^2 at each station respectively. Figure 25 illustrates that four stations had a low diversity, viz: 5, 6, 18, and 20, each with 10 or fewer species. Figure 26 shows that three of these four stations also had the lowest populations sampled during the study, viz: 5, 6, and 18. Station 20, however, had a population as large as three stations around it.

219. Computer analysis of data was performed using all 94 species, then using 70 species after all singly occurring species had been eliminated. Elimination of single occurrences reduced the total number of individuals by 0.5% (Table B2). In retrospect, this was probably not enough, but the data were species poor, and at the time the original analysis was done there was concern that too many species would be eliminated.

220. The two analyses resulted in the establishment of two major and two (or three) minor site groups. Certain stations having biotic components of both major site groups were moved from one site group to another as the rare species were eliminated. The two major site groups were II and IV. Site group II was basically an inshore assemblage of animals with a low to zero percentage of *Balanoglossus*, a high percentage of polychaete annelids, and lesser dominants among the nemerteans, crustaceans, and mollusks. The rare species were more frequently found in this site group. The substrate generally had a moderate to

strong sandy component. Site group IV was generally an offshore assemblage of animals dominated by *Balanoglossus*, with polychaetes as the second most prevalant organisms. Other groups were less frequently represented and, when present, constituted smaller percentages than in site group II. Site group I consisted of two stations, 1 and 8, which remained distinct from other groups regardless of the classification scheme employed. These two stations had high percentages of the phoronid worm, *Phoronis architecta*. With respect to dominance, stations 1 and 8 were similar to stations 9 and 16 in site group II, but diversity and population size were both lower at stations 1 and 8. Site group IV consisted of three stations that were characterized by low diversity and low populations. Table 5 illustrates that stations 5 and 6 had moderate to high percentages of hemichordates and thus probably are allied with site group IV. Station 18 had no hemichordates and is probably allied with site group II.

221. The final site groupings were based on the results of computer analysis using 70 species (Figures 27, B1). The analysis was subsequently run using 41 species (those occurring at 5 or more stations), and the results were similar. However, in the latter analysis, stations 7 and 14 were united with site group II because they had numerous representatives of less common species. The latter analysis also indicated that the inshore group (II) was actually composed of three subgroups, each with a group of benthic organisms more characteristic of a given subgroup than the others (Figures 28, B2). The subgroupings of site group II suggest a gradation of assemblages from inshore to offshore that followed the sediment gradient suggested by field notes and the mean sediment-size map constructed by R. J. Scrudato (personal communication, 1977, Moody College, Galveston). The site groupings are probably better represented by the arrangement in Figure 28. Note that station 6 joined the offshore site group, but stations 5 and 18 were distinct; after the rare groups had been removed, station 18 had only four species that were poorly represented numerically, and station 5 had only three.

Ordination

222. Figure 29 shows the two-dimensional locations of the stations when plotted in relation to axes 1 and 2. Stations 1 and 8 formed an isolated cluster as did stations 5, 6, 18, and 20. Most of the remaining stations were in one large cluster; station 2 was somewhat removed from the large cluster and may not be a part of it. These data indicated that the classification procedure was correct when stations 1 and 8 were isolated and the low diversity stations 5, 6, 18, and 20 were isolated. When viewed through axes 1 and 2, all the remaining stations appear to be members of one site group. However, when viewed from axes 1 and 3 (Figure 30), the stations are sorted into two distinct groups with a few outlying ones. The two groups of stations correspond closely with the inshore and offshore site groups produced by the classification procedure. The positions of stations in relation to axes 2 and 3 (Figure 31) show a pattern similar to that of axes 1 and 2, but the small clusters are not as distinct. Almost 50% of the total variance in the data was contained in the first three axes. Station groupings in other pairs of axes added little information.

Principal components analysis

223. Table 6 contains the eigenvectors of the principal components analysis (in PCA, the axis system is centered and rotated so that each successive axis accounts for the maximum amount of the variance remaining in the system; the set of coefficients that transform the original stations' coordinates to the final coordinates are called the eigenvectors). The absolute value of the eigenvector is proportional to the importance of the corresponding attribute in determining the position of an entity on the axis, and the sign of the eigenvector indicates the direction of the influence of the attribute. Positive eigenvectors indicate influence toward the positive end of the axis and vice versa.

224. The eigenvectors clearly show that the first axis was related to sediment characteristics; percent sand had a high positive value while percent silt, percent clay, mean phi, and median phi had high negative values. The second axis was related to the distribution of arsenic in the sediments. The third axis was related to the distri-

bution of iron.

225. Figure 32 shows the two-dimensional locations of stations when plotted against axes 1 and 2. The station groups were similar to the patterns suggested by the ordination of biological data. Two groups of offshore stations occurred in the high silt-clay range, but were widely separated by arsenic values. The other two groups were mostly inshore stations that were intermediate between silt-clay and sand and had intermediate levels of arsenic in the sediments. The station locations in relation to axes 1 and 3 (Figure 33) showed that most stations were contained in one large cluster that spanned the range of sediment types and was in the low to moderate iron range. Axes 2 and 3 separated the stations into clusters of stations with high to moderate and low levels of arsenic in the sediments and low to moderate iron levels excepting stations 6, 13, and 15 (Figure 34). Successive pairs of axes yielded little additional information. The PCA results indicated that, of the abiotic variables measured, sediment grain size was the most important in determining the relationship of stations to each other.

Optimum number of benthic samples

226. The optimum number of samples required to estimate benthic populations was determined by recording the number of species collected in the first sample, the number of previously unrecorded species in the second, third, etc., samples. The numbers of "new" species were plotted against the sample numbers. Ideally, the curve would rise sharply for the first few samples, then flatten out as the number of "new" species per sample decreased. The sample number when the curve flattened would be the optimum sample number. Stations 6, 17, and 21 were sampled 10 times (Appendix B). These stations represented three different substrate compositions: station 6 had a sand-mud bottom; station 17 had a high percentage of sand; and station 21 had a soft clay bottom with a lens of Pleistocene shells at a sediment depth of 40 cm.

227. Stations 6 and 21 were relatively similar in the shapes of their curves compared with station 17 and in the total number of species collected (Figure 34). The data indicated that more than 10 replicate

samples would be necessary to adequately sample the diverse benthic fauna at station 6; the curve showed no tendency to flatten out. The curve for station 21 showed a flattening tendency after the sixth replicate. The number of species collected at station 17 was generally more than 50% lower than at stations 6 or 21, and the curve appeared to flatten out after the eighth replicate.

228. The data in Appendix B showed some apparent sampling error. At station 6 there were no organisms in the eighth replicate, indicating that the spade corer may have dropped into a previous sample hole. There was also a decrease in the numbers of individuals collected after the third replicate, indicating that the repeated dropping of the box corer may have disrupted the bottom. Replicate 10 at station 17 may have been similarly affected.

229. All three stations had diverse faunae and 10 replicate samples would probably have provided a good estimate of faunal variability and population densities during the monitoring study. However, the time required to collect and process benthic samples made it impractical to collect more than five replicates.

Analysis of trawl samples

230. Twenty-one species of fin fish were collected during the pilot study along with eight species of nektonic invertebrates and 15 species of motile or sessile epibenthic invertebrates (Table C1). The trawl data are summarized in Table 7. Data from each station are presented in Appendix C.

231. Two species, the drum, *Micropogon undulatus*, and the portunid crab, *Callinectes similis*, were widespread and abundant throughout the study area. Other species, the anchovy, *Anchoa mitchilli*, the cutlass fish, *Trichiurus lepturus*, the sea robin, *Prionotus rubio*, the brown shrimp, *Penaeus aztecus*, and the short squid, *Loliguncula brevis*, were also widespread, but less abundant.

232. Of the remaining species, 10 were used to divide the study area into nearshore and offshore sites that corresponded roughly with the benthic site groups. The inshore group of trawl stations (1, 2, 3, and 4) was characterized by the shrimp, *Xiphopeneus krøyeri*, the blue

crab, *Callinectes sapidus*, the star drum, *Stellifer lanceolatus*, the sea trout, *Cynoscion arenarius*, the banded croaker, *Larimus fasciatus*, and the spot, *Leiostomus xanthurus*. The offshore group of stations (5-9) was characterized by the tongue fish, *Symphurus civitatus*, the white shrimp, *Penaeus setiferus*, and the mantis shrimp, *Squilla empusa*. The remaining species were either irregularly distributed or uncommon.

233. The separation of the study area into a nearshore sector and an offshore sector agreed with the analyses of the benthic data. The inshore group was collected from bottoms consisting of a moderate to high percentage of sand while the offshore bottoms were predominantly mud. Figure 36 illustrates the approximate inshore-offshore demarcation based on trawl data.

Analysis of zooplankton data

234. The raw zooplankton data are listed in Tables D1 and D2 as numbers of individuals of each meroplanktonic species and each holoplanktonic species per m^3 of water filtered. The data are summarized in Table 8.

235. Holoplanktonic crustaceans, particularly the Copepoda, dominated the sampled zooplankton populations and the Chaetognatha were second in abundance. The meroplanktonic component accounted for only 3 to 4 percent of the total population.

236. Table 8 also shows that considerable variation may be expected between replicates at the same station. However, when replicates were summed and averaged, the percent composition of the major taxa was similar inshore and offshore, particularly between the less dominant meroplankton.

PART VII: THE EXPERIMENTAL STUDY

Introduction

237. The experimental study, conducted between July 1975 and May 1976, began after the pilot study data had been analyzed and the distribution of the biota and sediments determined. This portion of the study had two major objectives: to assess the acute impact of dredged material disposal on the biota, water column, and sediments and to monitor changes occurring at the disposal stations as the dredged material was simultaneously recolonized by benthic organisms and modified by wave and current action.

238. The field crews were plagued by bad weather through much of the experimental study. The collection of biological samples in any given month required from three days to almost three weeks. Sampling cruises were occasionally aborted when the spade corer became unmanageable in heavy seas.

239. The geological data were collected concomitantly with the biological data in July. The geologists, however, were dissatisfied with the length of time required to collect both geological and biological samples; they conducted their own cruises between August and December 1975. Geological data were again collected with biological data from January through May 1976.

240. It was planned that immediately prior to the beginning of the August disposal operation, samples would be collected from the areas to be impacted by both dredging and disposal. This did not occur. The Galveston District had stated that the McFARLAND would be in Galveston on or about 24 August. There were to be two lay-by days before dredging commenced. Dredging actually began ahead of schedule, but neither the WES site manager nor the investigators were informed of the schedule change.

241. It was also planned that known amounts of dredged material would be deposited at each buoy during the August-September maintenance dredging operation. By knowing the initial amount of material deposited

and the configuration of the mounds, it would be theoretically possible to determine the rate of erosion by determining the configuration of the mounds after a given period of time. However, disposal did not occur as planned.

242. On one occasion in September (date not recorded) when the field crews (author included) were onsite to monitor a disposal, Dr. G. Fred Lee, heading the water-quality study, observed the McFARLAND dumping material at buoy C that should have gone to the buoy D site.

243. On another occasion in September (date not recorded), the field crew (author included) was onsite making the September collection and observed misdeposition of dredged material. The McFARLAND steamed down the entrance channel until she was a short distance beyond the south jetty. She executed a right turn, steamed a short distance to the southwest, made a 360° turn, and steamed back to the entrance channel. The dredged material disposal did not occur in the DMDS; it occurred some distance north to northwest of buoy B (that lay near the inshore boundary of the DMDS) in the vicinity of the topo-graphic high described in the bathymetry section (Part III) between the DMDS and the south jetty. This operation occurred several times while the field crew was onsite. There is no reason to suspect that it did not also occur when the investigators were not onsite.

244. This misdeposition presents a considerable problem in the interpretation of the overall results of the study. The daily dredge logs, with the exception of the last three in September, do not indicate at which buoy the material was deposited. The amounts of material deposited at each buoy were estimated by WES personnel based on where the dredge should have gone and the running time from dredging site to disposal site. Therefore, a calculation of the amount of material deposited at any given buoy is, at best, an educated guess, and the amount of material deposited at any given site can never be accurately determined.

245. Knowledge of the quantity of material deposited at the buoys was to act as a correction factor for information gathered during the bathymetric surveys. The calculated amount of material contained within

each isobath describing a dredged material mound would provide an approximation of the amount of material in that mound. Obviously if the vessel, while conducting bathymetric surveys, did not pass over an isolated submound or missed the top of the main mound, the calculated volume of the mound would be different from the actual volume. Accurate knowledge of the amount of material deposited would provide an estimate of the degree of error in calculated volume. Because the quantities of disposed material are not known, no accurate estimate of eroded material can be made.

246. Another factor that compounded the problems with disposal studies was the failure of the microwave positioning system used on the project to function properly most of the time. The problem was finally attributed to the presence of another microwave system in the area but not before the project was nearly completed. Thus, only two reliable bathymetric surveys were made during the monitoring study, one just after disposal operations were completed in September 1975 and one in June 1976. Short-term changes in the mounds were therefore not determined.

247. In February 1976, the McFARLAND began maintenance dredging and disposing dredged material in the DMDS and again neither the site manager nor the principal investigators were informed of the dredging schedule. Mr. Clyde Henry, who was doing an MS thesis study in the vicinity of the DMDS, made a collection on 19 February. He and his crew observed the McFARLAND make several disposal runs at buoy B. The author subsequently learned that WES personnel did not know dredging was occurring. The quantity of material disposed at buoy B was calculated based on dredge logs and must be viewed with skepticism in view of the extra-DMDS disposal operations observed in September.

Study Design

The monitoring studies

248. As mentioned previously, five of the 28 blocks were selected, based primarily on similarities in benthic populations, for study

during the experimental portion of this project. Two blocks, 2 and 15, had sand substrates. Block 2 was designated as an experimental area to receive dredged material as many times as dredging occurred during the span of the study. Block 15 was the control for block 2.

249. Three blocks, 12, 14, and 27, had silt-clay substrates. Blocks 12 and 14 were designated as experimental areas to receive one-time disposals of predominantly sandy and predominantly silt-clay material, respectively. Block 27 was the control area for blocks 12 and 14.

250. The buoys placed in the DMDS were to provide an easy target for the dredge to home in on when making a disposal run. The intended buoy locations are shown in Figure 37. After the buoys had been placed by the Coast Guard, the Texas A&M geological oceanographers, using satellite and microwave navigation, calculated that none of the buoys were in their intended positions; buoy B was southwest of its intended position and buoys C and D were offshore from their intended positions. Station 3 in block 27 was intended to be 1.8 km due southwest of the halfway point between buoys C and D. The location of this station now fell due southwest of buoy C and this location was used in all but the September cruises.

251. The buoy locations were subsequently independently recalculated by Mr. Bruce Sidner, Texas A&M University, and Dr. Thomas Wright, WES. These calculations showed that the buoy locations, while still not in the intended locations, were closer than previously calculated (Figure 37). Thus block 27 stations were mostly in block 26.

252. Five stations were established in each block. In block 2, the pattern was T-shaped; on the other blocks it was a cross (Figure 38). The coordinates of the stations are presented in Table 9. The primary disposal stations were marked by a buoy in each experimental block. The remaining four stations were located inshore (except in block 2), offshore, northeast, and southwest of the buoy. The purpose of the outlying stations was to determine if dredged material was being moved away from the primary disposal sites by natural forces. Stations 1, 3, and 5 ran inshore to offshore. Stations 2, 3, and 4 ran northeast

to southwest.

253. All blocks were sampled bimonthly (every other month) at a minimum from July 1975 through May 1976. These collections included one predisposal collection (July 1975), one collection while disposal was in progress (September 1975), and four postdisposal collections (November 1975-May 1976).

254. The dredge McFARLAND commenced maintenance dredging on 24 August 1975 and disposal continued on an almost daily basis through 24 September. During this period the estimated volumes of sediment deposited at each disposal site were: buoy B, 190,700 m^3; buoy C, 105,500 m^3; buoy D, 195,700 m^3. However, as mentioned previously these figures are highly suspect. The daily volumes of dredged material deposited in the DMDS (based on WES calculations) are listed in Table 10. During the period of maintenance dredging between 18 February and 3 March, an estimated 276,246 m^3 of material were removed from the channel and reportedly disposed at buoy B (personal communication, T. D. Wright, 1976, WES).

255. Several cruises were planned to monitor the effects of the mud plume after the dredge made its disposal run. Adverse weather conditions aborted most of these cruises and hampered others. The only biological data collected were phytoplankton samples on 9 September.

<u>The Texas City dredged material study</u>

256. On 9 and 10 October 1975, a special monitoring study was conducted. The EPA granted permission for offshore disposal of material, which had been designated polluted, from the Texas City turning basin. It was estimated that six dredge loads of material could be obtained from the turning basin. Actually there was only enough material for three loads.

257. The experimental disposals were conducted during daylight hours at a special station established about 1 km south of buoy B. The station was marked by a temporary buoy. During the first disposal on the morning of 9 October, the research vessels were not anchored in the proper location and only the fringes of the mud plume were monitored. During the second disposal in the afternoon of 9 October, the vessels

moved into the mud plume and held position until the plume had dispersed. This disposal was also monitored by aerial photography (Bouma et al., 1976). A series of both phytoplankton and zooplankton samples were obtained during the second disposal. The third disposal occurred on the morning of 10 October and was monitored by geological personnel only.

Field Techniques

Macrobenthos

258. Five replicate spade core samples were collected at each station during each collection period. During the last three collections, a 2.54-cm core was removed from each spade core sample for geological analysis, and a sixth spade core sample was collected for geological analysis. Sedimentological notes were made at each station. Three of the macrobenthic replicate samples (1, 3, and 5) were analyzed. Replicates 2 and 4 were stored.

259. Henry (1976) obtained five replicate spade core samples from two stations in the entrance channel each month between May 1975 and April 1976. No benthos samples were obtained during the Texas City experimental disposal.

Meiobenthos

260. When possible, one meiofaunal sample was obtained from each macrofaunal sample as described previously. This study was terminated after November 1975.

Nekton

261. Three trawls were made in each of the five study areas in the DMDS. In the experimental blocks, the course of trawl 2 was located along the course followed by the dredge as she made her disposal runs past the buoys. Trawls 1 and 3 were made 400 m northeast and southwest of trawl 2, respectively. This pattern was used to detect changes in nektonic and macro-epibenthic populations due to movement of dredged material. In the control blocks, trawl 2 passed as close as possible to the center of the block. All trawls were made in a northwest-southeast

direction.

Zooplankton

262. Zooplankton collections were made monthly during the experimental study between July and November 1975. Two replicate samples were collected in the entrance channel near buoy 7 and two within the DMDS in the manner previously described.

263. During the 9 October Texas City material disposal, three zooplankton tows were made. These tows included a predisposal tow about 30 min prior to disposal, a tow in the mud plume, and a postdisposal tow after the plume had disappeared.

Phytoplankton

264. Phytoplankton samples were collected monthly between August and December 1975 as previously described. Samples were collected from the entrance channel and the DMDS.

265. Phytoplankton samples were also obtained on 9 September and 9 October during disposal monitoring studies. On 9 September, predisposal samples and samples in the mud plume were obtained. On 9 October, samples were obtained prior to disposal and at intervals of 10, 16, 30, and 50 min after disposal; sampling was discontinued when the bottom water had cleared.

Results

Benthos

266. Macrobenthos: populations. The changes in the benthic populations through the span of the entire study are shown in Figure 39. The control population data include the pilot study data (the data point was placed toward the end of April, which was about the midpoint of the benthic collections) and the averaged data from the control stations in blocks 15 and 27. Each data point represents the average number of individuals per m^2.

267. The data show that the pilot study populations (April) were quite large compared with the populations at the control stations during the experimental study. As was mentioned in Part VI, large numbers of

the hemichordate *Balanoglossus* sp. accounted for much of the April population; if hemichordates are eliminated from the data, the populations would average 718 individuals per m^2, which is as large as several of the average populations collected during the experimental study.

268. The average control population declined sharply between April and July and continued to decline through September. In November, the population increased to about the level recorded in July; this increase may represent the fall spawning period. By January the control population had declined again, remained at the same level through March, and then increased slightly in May. The difference between the spring populations in successive years is obvious.

269. Figure 39 also shows the trends of the average benthic population at the 15 experimental stations. The average experimental population was nearly identical in number to the control population in July and September. From these data there is no evidence of an acute impact on the benthic population due to the disposal of dredged material. In November, however, the average experimental station populations increased, but were depressed by 90 individuals per m^2 compared with the control population. However, during the remainder of the study, the average experimental populations were 90-110 individuals per m^2 larger than the control populations. There does appear to be an enhancement effect, which became manifest in the months following the cessation of disposal operations.

270. The temporal changes in the average population at the stations in each block are shown in Figures 40 through 44. The control stations' population trends (Figures 41, 44) were similar at all stations during the first four bimonthly collections. The populations declined between July and September, increased in November, and decreased again in January. A common trend is not evident in March and May; two of the five stations in each block displayed population changes that ran counter to the trend of the other three. In the experimental blocks, the populations did not show a common trend, either between blocks or between stations in a given block.

271. In the following descriptions of the population or diversity changes in each block, reference is made to the presence or absence of dredged material in the samples. These data are based primarily on field examination of the samples as they emerged from the core box. Large lumps of Beaumont Clay and/or large amounts of small shells or shell fragments and sand were considered dredged material. In many cases there was a sharp demarcation between what had been the sea bottom surface and the dredged material on top of it. However, the data, which were based on the experience of the field personnel who were familiar with the area and who observed both natural bottoms and bottoms overlain by dredged material, cannot be quantitated. Tables 11 through 15 list the field description of the sediments, the shell hash volume, percent carbonate, and mean grain size at each station.

272. It is also noted here that there was no consistent correlation pattern in any of the analyses comparing benthic populations with sediment data. A few correlation coefficents were as high as ± 0.8. Most were less than ± 0.5 and some were less than ± 0.1. Variance ratios calculated for each pair of blocks using mean population data at each station each month indicated that only the populations in block 12 were not significantly different from the population in any other block (Table 16). One-way ANOVA using mean population data indicated there was no significant difference between stations within blocks (Table 17). Nor was there a significant difference in the diversity between stations within blocks (Table 17). The following analyses of changes in populations and diversities within blocks are descriptive only.

a. Population changes in block 2. Dredged material disposal occurred at buoy B on 24-26 August and 10-24 September 1975 with station 2-1 as the primary disposal site in block 2. Samples were collected in block 2 on 18 and 20 September, shortly before maintenance dredging terminated. The presence of shell hash and clay at stations 2-1 and 2-5 (Table 11) indicated that disposal had occurred at both of these stations. There was, however, no obvious acute impact on the benthic populations caused by disposal. The temporal trends of the populations

at stations 2-1 and 2-5 were similar to the population trends at the other stations in block 2 and to the control stations in block 15 from July through November (Figure 40). In January, however, the populations at stations 2-1 and 2-5 declined while increases occurred at the other block 2 stations. Large quantities of shell hash with lumps of Beaumont Clay were collected concomitantly with the population decrease (note the large volume of shell material and the corresponding high carbonate percentage at station 2-1 in Table 11).

Maintenance dredging occurred again between 18 February and 3 March 1976 with all of the material reportedly deposited at buoy B. Block 2 stations were sampled on 31 March, and Beaumont Clay and/or sand-shell were again collected at stations 2-1 and 2-5. The populations at these stations continued the decrease begun in January (it should be noted that all populations in block 2 decreased in March). For the first (and only) time, large quantities of shell hash were collected at station 2-2, indicating that one or more dredge loads of material was deposited 400 m to the northeast of buoy B (assuming that the station location was consistent through all collections). The population decrease at station 2-2 was not as great as at station 2-3 or 2-4 (at no time during the study was there evidence that disposal had occurred at either station 2-3 or 2-4).

In May the populations at stations 2-1 and 2-5 increased. At 2-1, small quantities of Beaumont Clay were collected in contrast to the two previous collections. Large quantities of shell hash were not evident in the field at station 2-5 although the shell hash volume was similar to the volumes recorded in January and March. There was no indication of disposal at station 2-2; the deposit may have been a small one that was missed in May or the material may have been eroded.

Henry (1976) collected monthly benthic samples at station 2-1 (his station 1) from May 1975 through April 1976, providing more frequent data points with which to describe temporal population trends. Henry analyzed five replicate samples; comparison of the population trends using data from both three and five replicate samples indicated that considerable differences in estimated population sizes may occur if

only three replicate samples were used in data analysis. Henry's data (Figure 45) indicated that both a fall and a spring reproductive period occurred. The November population increase occurred at all of Henry's stations and agreed with the data collected during the present study, but the February increase was missed by the bimonthly sampling pattern of the present study. There was little indication of a February increase in Henry's muddy bottom control areas across the ship channel from the DMDS. Henry's data from station 2-1, examined alone, indicated that the population was depressed when sampled on 3 September, a week after disposal at buoy B was terminated. However, the populations at his muddy bottom control stations also declined, and it cannot be determined how much of the decrease at station 2-1, if any, can be attributed to disposal.

The unannounced maintenance dredging and disposal at buoy B began, according to WES information, on 18 February 1976. Henry sampled station 2-1 on 19 February and found a large benthic population. There was no indication that dredged material had been deposited at the site prior to his collection, although he reported that the McFARLAND made several disposal runs to buoy B while he was collecting samples at his other stations.

The commencing of dredging and disposal on 18 February and the absence of dredged material at buoy B on 19 February are inconsistent. Station location error was not to blame--station 2-1 was beside buoy B. In view of the extra-DMDS disposal observed during the August-September disposal period, the author is of the opinion that the dredge crew finally learned to recognize the R/V TEXAS STAR and made certain their disposal runs were to the DMDS whenever the field crew was onsite.

The station 2-1 population sampled in March by Henry was depressed and dredged material (shell hash and Beaumont Clay) was collected. His muddy bottom control populations increased in March, indicating that the dredged material at station 2-1 may have had a depressive effect.

b. Population changes in block 12. In block 12, station 12-3 (buoy C) was the principal disposal site, receiving primarily sand-

shell dredged material during the August-September disposal period. This station was not, to the author's knowledge, used for disposal during February and March 1976. Station 12-5 was located about 200 m instead of 400 m seaward of buoy C so that two sets of samples would be collected from disposal sites in block 12.

According to WES information, disposal occurred at buoy C between 10 and 14 September. The second bimonthly collections occurred on 16 and 27 September, after the disposal at buoy C had been completed. Dredged material was evident only at stations 12-3 (sand-shell with clay lumps) and 12-5 (layer of sand over mud and shell hash) (Table 13). A large quantity of shell hash was collected at station 12-1 but there was no field evidence of disposal (also note that the July samples at station 12-1, which were collected about 400 m shoreward of the equivalent September samples, contained apparent dredged material).

There were no temporal population trends common to all stations (Figure 42). Between July and September, the populations at three stations, including disposal station 12-3, decreased, while two, including disposal station 12-5, increased. Dredged material was evident at station 12-3 from September through May (Table 13). Following the decrease in September, the population at this station increased to a March peak of about 4000 individuals per m^2, the largest post-July population sampled anywhere in the DMDS. Almost one-half of the increase in January was due to large numbers of a single species, the archiannelid, *Polygordius appendiculatus*. In March, *Polygordius* was replaced as the dominant organism by large populations of the polychaete, *Spiophanes bombyx* (a sandy bottom dweller) and nematodes. The total population declined in May.

During the entire postdisposal portion of the study, the substrate at station 12-3 was obviously dredged material. Although Beaumont Clay was not present after November, large quantities of shell were collected each time the station was sampled and the amount of shell hash alternately increased and decreased between September and May (Table 13). In January, the shell evidently paved the bottom because the spade corer would not penetrate and a van Veen grab had to be used

to collect samples.

At station 12-5 the populations followed the same temporal trend as those at station 12-3 from November through May but the population increases were not caused by the same organisms and they occurred on dissimilar bottoms. At station 12-5 the sediment was fine grained between January and May, and there was very little shell hash; a layer of sandy mud was the only evidence of disposal. The hemichordate, *Balanoglossus* sp. accounted for over half of the peak population recorded at station 12-5 in March.

There was no evidence of dredged material at station 12-1, 12-2, or 12-4 while disposal was occurring or afterward until January, when sand, shell, and Beaumont Clay were collected at stations 12-1 and 12-2. The populations at both stations increased between November and January. In March there was slight evidence of disposal material at station 12-2 only. In May, the sediment at station 12-4 contained large quantities of shell hash. The population increased in May at this station, following a decline that had begun in January.

c. Population changes in block 14. Station 14-3 (buoy D) in block 14 was the primary disposal site for silt-clay material during the August-September period of maintenance dredging. Disposal occurred at buoy D, according to WES records, from 27 August through 10 September. This station did not, to the author's knowledge, receive any dredged material during the February-March maintenance dredging period.

The September samples were collected on the fifteenth, five days after disposal at buoy D had terminated. There was no obvious evidence of dredged material in the sediments at any station in block 14 (Table 14). The populations in block 14 decreased between July and September (Figure 43) as they did in the control areas (Figures 41, 45). It must be remembered that because of the misplacement of buoy D, all stations in July were located about 800 m shoreward of their post-July locations. In November, Beaumont Clay and shell material were collected at station 14-4 and the populations were larger than in September. Still more shell hash (but less clay) was collected in January. In March and May smaller quantities of both clay and shell hash were col-

lected as compared with the January collection. The population trend at station 14-3 did not show any apparent correlation with changes in the sediment composition during this time.

In January, Beaumont Clay was collected at stations 14-1 (with large quantities of shell hash) and 14-2. The population at station 14-1 increased from the November level while that at station 14-2 decreased. In March there was evidence of dredged material at stations 14-4 (sand and shell with small amounts of Beaumont Clay) and 14-5 (shell hash). The populations at both stations increased while the populations at the other block 14 stations decreased. In May, shell hash and Beaumont Clay were collected at station 14-1 concomitantly with a population increase. Population increases also occurred at three of the other block 14 stations.

d. Ship channel populations. Henry (1976) sampled two stations in the entrance channel adjacent to the DMDS each month. The temporal population trends are shown in Figure 46. In May, the entrance channel bottom contained large numbers of individuals. This agreed with pilot study data from the DMDS. The population declined precipitously between May and June. The sediments were soft sandy or muddy clay in May, June, and July, indicating that a change in the sediment composition or texture was not responsible for the population decrease. In July, prior to the initiation of dredging, there was a slight indication that the populations were increasing. The McFARLAND was dredging in the vicinity of Henry's entrance channel stations when the August (which actually occurred on 3 September) sampling cruise was made and samples were not obtained. The populations were presumed to have been low.

In September, the bottom sediments of the channel were a thin layer of soft silt over Beaumont Clay. Beaumont Clay is very cohesive and almost impenetrable; very shallow samples were obtained. The populations were very low.

The population increased in November concomitantly with the increase observed at most stations in the present study. The layer of softer sediments overlying the Beaumont Clay had increased in thickness. For the remainder of the study, the population trends were similar to

the trends Henry observed at station 2-1, including a February peak. In March, after the February-March maintenance dredging, the populations were quite low in the channel and were still low in April when the last collection was made.

273. Macrobenthos: diversity. The total number of species in three replicate samples was calculated for each station to determine if dredged material disposal affected the diversity. The data are shown in Figures 47 through 51.

274. A comparison of the control blocks (Figures 48, 51) shows that unlike the population trends, the diversity trends in the two blocks are diametrically opposed in most cases. In block 27 (Figure 51), the mud bottom control station, the species trend was similar to the population trend (Figure 44), with a decrease in species from July to September, an increase in November, and a decrease in January. There was no common trend in March or May. The block 15 (sandy bottom control stations) (Figure 48) diversity trends were opposite to the population trends; i.e., each time the population decreased, it became more diverse and vice versa. The uniformity of the trend between stations was lost as the study progressed.

a. Diversity changes in block 2. In block 2, the changes in diversity became more uniform toward the end of the study (Figure 47). The diversity decreased at two of the five stations between July and September. The decrease was greatest (11 species) at station 2-1, the principal site of dredged material disposal in August and September. At station 2-5, which was also a disposal site according to sedimentological notes (Table 12), a diversity increase almost as great as the decrease at station 2-1 occurred (10 species). From these data it was not possible to distinguish between acute impact, if any, and the natural changes in diversity. After the February-March disposal, the diversity at four of the five stations decreased, stations 2-1 and 2-5 included.

b. Diversity changes in block 12. In block 12, the sediments at all stations appeared to contain dredged material at one time or another although 12-3 was the principal disposal site and the one

station that consistently appeared to have been impacted (Table 13). Disposal occurred in September. The diversity of stations 12-1, 12-3, and 12-4 decreased, with the greatest decrease at station 12-1 (22 species) (there was no evidence of dredged material at either 12-1 or 12-4 until January or later). The diversity at station 12-5, which was located on sandy dredged material, increased in September (Figure 49).

At station 12-3, as was previously stated, the quantity of shell hash alternately increased and decreased between September and May. This possibly means that fine material was alternately deposited in and removed from the interstices of the shell hash by waves and currents. After September, the diversity changed little with each decrease in the shell hash volume but increased sharply with an increase in shell hash. The general trend was toward increased diversity over the postdisposal span of the study.

The temporal diversity trend at station 12-5 was opposite that of 12-3. After the initial increase, the diversity decreased through January as the sand was infiltrated by silts and clays. The diversity increased between January and May.

Shell hash and Beaumont Clay were collected at stations 12-1 and 12-2 in January. The diversity at these two stations increased between November and January. The diversity also increased at station 12-4 in January when the sediments had some shell hash mixed with the soft material as opposed to a soft clay bottom in November. In May large quantities of shell hash were collected at 12-4 and the diversity increased sharply.

c. Diversity changes in block 14. Dredged material disposal occurred at station 14-3 in August and September. The diversity at all stations decreased between July and September, but the decrease was greatest at 14-3 (recall that each post-July station was located about 800 m seaward of the July location). The diversity at 14-3 increased in November as the amount of shell hash increased and was stable for the remainder of the study while the shell hash volume increased and then decreased (Figure 50).

The diversity at 14-2 remained essentially unchanged between

July and January, even though Beaumont Clay and shell hash were collected in January. A decrease occurred in March when no evidence of dredged material was observed. Dredged material was collected at 14-1 in January and May and the diversity increased in both months above the levels recorded previously.

275. Macrobenthos: numerical analysis. The analysis of benthic data was first accomplished using each replicate as an entity. This was done for each bimonthly collection. Next, the replicates at each station were summed and averaged and an analysis of each bimonthly collection was done. The bimonthly data were concatenated serially and an analysis was run at each incremental stage. This method made more and more data available for analysis. In the final stage of data accretion, the station data from all six bimonthly collections were analyzed.

276. The discussion of these analyses will proceed in the reverse order. In analyzing the data, it made more sense to begin the discussion with the largest data component and then successively break the data into smaller and smaller components. It will be noted that at each successively lower data level, the clusters in the dendrograms became less concise and the stations of a given block had less of a tendency to cluster together. At the lowest level, using each replicate as an entity, the information contained in the data was so diffuse that the clusters were of little use in determining the effects of dredged material on the benthos.

a. July-May data. The computer analysis of the six combined bimonthly collections produced four discrete site groups (Figure 52), the stations in each group having a high degree of similarity. All stations in blocks 2 and 15 (hereafter referred to as the inshore site group) clustered together as did all the stations in blocks 12 and 14 (the offshore site group) except station 12-3. Block 27 stations formed a distinct cluster that was allied with the offshore site group. Ordination (not shown) confirmed that the clusters were distinct, but also showed that the stations in a cluster were often widely separated. Station 12-3 was extremely isolated.

Examination of the two-way table (Table 18) reveals that

AD-A061 844 ARMY ENGINEER WATERWAYS EXPERIMENT STATION VICKSBURG MISS F/G 13/3
AQUATIC DISPOSAL FIELD INVESTIGATIONS GALVESTON, TEXAS, OFFSHOR--ETC(U)
MAY 78 T D WRIGHT, D B MATHIS, J M BRANNON
UNCLASSIFIED WES-TR-D-77-20 NL

3 OF 10
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species group 1 consisted of species that were widely distributed; most were collected at every station at sometime during the study. Species group 2 members were also widely distributed, but were less common at block 27 stations. Several members of this group, viz: *Prionospio cirrifera, Pagurus annulipes, Spiophanes bombyx,* Nematoda, and *Polygordius appendiculatus,* were present in large numbers at station 12-3 and combined to make 12-3 a unique site. *Polygordius* in particular was collected almost exclusively at station 12-3.

Species group 3 was characteristic of the inshore site group. Species group 4 was characteristic of the offshore site group, and the species were particularly abundant at station 12-3. Species group 5 was characteristic of both the offshore and block 27 site groups. Species group 6 was composed of species that did not especially characterize any one site group. The abundance and occurrence of the species in species groups 3, 4, and 5 allied station 12-3 with the offshore site group.

b. November-May data. This analysis included all the data collected during the four postdisposal cruises. As with the six collection analysis, the stations segregated into an inshore site group, an offshore site group, and a block 27 group (Figure 53). Stations 12-3 and 12-4, two of the three stations at which *Polygordius* was collected, formed a separate cluster. The dissimilarity between clusters was slightly greater than in the six collection analysis. In the inshore site group, there was evidence of three separate clusters forming, with station 2-1 forming a one-station site group. Ordination (not shown) showed that station 2-1 was widely separated in space from the inshore cluster and should probably be made a separate group. The remaining inshore stations were tightly clustered. The block 27 group was also tightly clustered, but the offshore stations were widely separated. Station 12-3 was alone, but there was no evidence that it was allied with station 12-4.

Species group 1 (Table 19) was again composed of the widespread species, but the elimination of two sets of data reduced the number of species in this group. Species group 2 members, while wide-

spread, were present in larger numbers at inshore stations. Species group 3 consisted of three species that were only abundant at stations 12-3 and 12-4, *Spiophanes bombyx, Polygordius,* and the nematodes. Species group 4 was characteristic of the offshore site group, while 5 was characteristic of the offshore site group and of stations 12-3 and 12-4. Species group 6 was characterized by species that were usually either very abundant or entirely absent in all site groups. The last three species groups were characteristic of the inshore site group.

c. January, March, May data. This analysis involved the last three collections, i.e., those for which sediment data were collected concomitantly with biological data (Figure 54). In this analysis, station 2-1 separated from the inshore site group and formed a single-station site group. This was caused not so much by the presence of certain species, but because of the complete lack of representatives of species groups 5 and 6 and a lack of most species in group 4 (Table 20). The species that were present allied station 2-1 with the inshore site group. As in the previous analysis, stations 12-3 and 12-4 formed a cluster allied with the offshore site group. It will also be noted that for the first time, the block 27 site group was joined by an offshore station (14-4). Ordination (not shown) confirmed the groups described above, but again showed that the stations were not tightly clustered in space.

Species group 1 was generally widespread, but conspicuous absences may be seen in the block 27 site group. Species group 2 was characteristic of the inshore site group. Species group 3 was primarily characteristic of stations 12-3 and 12-4. Species group 4 consisted of species that were generally not present anywhere but in site group 1. Species group 5 was characteristic of the offshore site group and stations 12-3 and 12-4. The last species group consisted of species that were not characteristic of any site group. Species groups 2, 4, and 5 allied stations 12-3 and 12-4 with the offshore site group.

d. November-January and March-May data. The November-May data were broken into two smaller groups of two collections each. In both analyses, while the similarity between major clusters remained

approximately the same as in the previous analyses, the ecological distance between most stations increased.

In the November-January analysis, the inshore site group, exclusive of station 2-1, was intact (Figure 55). Stations 2-1 and 12-3 formed a site group. In January, large amounts of shell hash were collected at both of these stations (the 2-1 population was decreasing while the 12-3 population was increasing relative to the November population). The block 27 site group was broken up completely and was integrated into the offshore site group. Stations 14-1 and 14-3 also formed a cluster. Ordination (not shown) showed that stations 2-1 and 12-3 were closely related and were widely separated from the other groups. The inshore site group was a fairly tight cluster, but the offshore stations were widely spread. Stations 14-1 and 14-3 did not form a separate cluster.

Species group 1 was primarily characteristic of station 2-1 (Table 21). Species group 2 was characteristic of the inshore site group, while group 3 consisted of the echiuroid, *Thalassema hartmani*, and associated commensals found primarily at station 15-4. Species group 4 consisted of widespread species. Species group 5 consisted primarily of species that were abundant at station 12-3. Species group 6 was more characteristic of the offshore site group than any other, but many of the species were not represented at various offshore stations. The last site group was characteristic of stations 14-1 and 14-3, both of which had large quantities of shell hash in the sediments in January. Thus, the four stations at which large volumes of shell material were collected in November and/or January, viz: 2-1, 12-3, 14-1, and 14-3 had populations that were different enough to separate them from the main clusters, yet the populations of each of the two smaller clusters were quite different. Species groups 1 and 5 were poorly represented at stations 14-1 and 14-3. Species group 7 was poorly represented at stations 2-1 and 12-3.

The March-May clusters were much more discrete than those formed by the November-January data (Figure 56). The clusters were similar to those of the January, March, and May data combined. The

species groups were also similar (Table 22). The smaller amounts of shell hash in the sediments at station 2-1 in March and May apparently made the fauna different from that found at station 12-3, because the two stations did not form a separate cluster. The clustering arrangement agreed with the ordination data (not shown).

e. The bimonthly data. As will be seen in the following six analyses, there was much less of a tendency for the stations to fall into distinct inshore and offshore clusters as was the case when the data for two or more months were summed. The ordination plots (not shown) resembled scatter diagrams in many cases; there was little tendency for the stations to form discrete clusters. In the July analysis (Figure 57), site group 1 stations, with one exception, were from offshore and block 27. Site group 2 consisted of four of the five stations in block 14. Site group 3 was an inshore cluster, the stations of which were poorly represented by both species and individuals in species groups 3, 4, and 5 (Table 23). Site group 4 was a mixture of inshore and offshore stations. The remaining two site groups were unique because stations 12-5 and 14-1 were virtually unrepresented by members of species group 4 and because station 2-1 had no representatives of species group 3 or 4 and poor representation by species in group 2.

It should be remembered that both the number of species and number of individuals decreased at most stations between July and September; thus, the September analysis was based on fewer data than the July analysis. Site group 1 (Figure 58) was a mixture of representatives from each of the five blocks and was characterized by species group 3 (Table 24). Site group 2 contained all inshore stations except one; station 12-3 was clustered with station 2-1 before the large group was joined. This group and the last site group were clustered by the absence of species; species groups 1 and 6 were not represented in site group 3 and species group 2 was poorly represented.

The site groups formed by the analysis of November benthic data (Figure 59) were more discrete than the September site groups. Site group 1 consisted of inshore stations at which specimens of species groups 1 through 4 were fairly well represented (Table 25). Site group

2 consisted of five stations, four of which were located on disposal sites. Also note that while there was a tendency to cluster, there was a high degree of dissimilarity between each of the stations. Stations 2-1 and 15-4 formed a cluster; station 14-3 formed a single station site group; and stations 12-3 and 12-5 formed a cluster. The disposal stations did not have many species in common. Stations 12-3 and 12-5 were fairly well represented by members of species groups 2 and 3, and poorly represented by species groups 4, 5, and 6. Stations 15-4 and 2-1 were poorly represented by species groups 4, 5, and 6 and not well represented by species group 3. Station 14-3 was characterized by large numbers of individuals of members of species group 5.

The populations at all control stations and many experimental stations decreased between November and January. The clusters formed by the January data (Figure 60) were not as discrete as those formed by the November data. Site group 1 was an inshore group characterized by species groups 2 and 3 (Table 26). Site group 2 was a mixture of inshore and offshore stations primarily characterized by a lack of any dominant species group. Site group 3 was an offshore cluster (note that station 14-3 was included in this group) that was characterized by species group 5. Site group 4 consisted of stations 2-1 and 12-3. These stations were probably clustered together because of poor representation in the species groups. It will be seen that the more widespread species group, 4, was not well represented at stations 2-1 and 12-3. The last site group consisted of offshore and block 27 stations and was characterized by poor representation in all species groups except 4, the widespread group.

Six site groups were formed by analysis of the March data (Figure 61). Site groups 1 and 2 were related, but were separated because species group 1 was more frequently present and more abundant in site group 1 than in site group 2 (Table 27). Site group 3 was composed of stations 12-3 and 14-5. These stations were joined by the occurrence and abundance of the species in species group 3. Station 15-1 was made unique by species group 4 and the poor representation of species in groups 3 and 5. Station 2-1 was unique because of the absence of

representatives of species groups 4, 6, and 7 and the poor representation by species groups 3 and 5. Site group 6 was characterized primarily by species group 5.

Five site groups were formed by analysis of the May data (Figure 62). Site groups 1 and 2, primarily inshore stations, were related but separated by the representation and abundance of the species in group 6 (Table 28). Site groups 3 and 4 were offshore clusters and group 5 consisted of block 27 stations. Site group 3 was best characterized by species group 5. The large numbers in species group 3 and the absence of members of species group 7 made the stations 12-3 and 12-4 cluster unique. The block 27 stations were not well represented in species groups 3 through 7.

f. Individual replicate data. In these analyses, each replicate was an entity, which made each entity relatively data poor, and it was the exception rather than the rule to have all three replicates from a given station cluster together with a high degree of similarity. In many instances inshore and offshore replicates clustered together. This method of analysis contained little useful information, except that the populations from replicate samples at a given station were often very dissimilar (see also the mean and standard deviation data for each station, Appendix E). Examination of the raw macrobenthic data showed that in many cases there was little similarity between replicates at the same stations either in terms of species present or numbers of individuals. The same variability was also obtained in sediment analyses (Scrudato and Estes, 1977). This variability was not a function of sampling error due to vessel drift. The vessel was anchored when sampling occurred, and the only movement was along an arc as the boat moved in response to wind, waves, and currents. No patterns were evident in the analyses by replicates, and this aspect of the data is not discussed further.

277. Meiobenthic vs. macrobenthic populations. As previously stated, problems were encountered in obtaining a meiofaunal sample from each core, and there are numerous blanks in the data matrices for the three months in which meiofaunal samples were obtained. Even though all

samples collected were analyzed (compared with only three of five macrofaunal samples), there were insufficient data to compare population trends between stations or even between control blocks. There was little correlation between the sizes of macrobenthic and meiobenthic populations in most cases. There was wide variability in the numbers of individuals per replicate sample at the same station and there was also wide variability in the ratios of macrofaunal to meiofaunal populations (Appendix F).

278. Discussion. It is generally recognized that temperature plays a primary role in determining the reproductive period and distribution of marine organisms. Gunter (1957) summarized the information on reproduction as related to temperature. Spawning in temperate regions is associated with increasing temperature; rising temperatures trigger gametogenesis, and spawning occurs when a certain temperature (constant for a given species in a given locality) is reached or surpassed if all other conditions are favorable. Conversely, other species spawn when the temperature begins to decline. In previous studies in the Galveston area, viz: Mackin (1971) in Trinity Bay, Holland et al. (1973) in Galveston Bay, Gillard (1974) in upper Galveston Bay, and McBee (1975) in the Ceday Bayou-Trinity Bay area, the largest total populations occurred in the January-May period of their studies. Offshore data (Harper, unpublished data; the present study) agreed with this general pattern. These data indicated that the species were largely spring spawners. However, comparison of data collected by Gillard (1974), Holland et al. (1973), and McBee (1975) showed that January population increases occurred in 1971 and 1972 even though the temperatures remained low through January or February. This suggested that the animals were spawning in late fall and that the larvae settled in large numbers in January or February. Preceding the spring increases in both years were salinity decreases in the fall, indicating a salinity influence on reproduction or at least the metamorphosis and settling of the larvae.

279. It was also quite apparent that salinity played a major role in determining the timing of reproduction and/or the species recruited in the DMDS. Reference to Figure 63 shows that freshwater discharge

increased beginning in September 1974 and averaged about 50×10^6 m^3 each month through June 1975. The salinity in the Galveston Channel underwent a concomitant decrease from about 29 ppt in July 1974 to 12 ppt in May 1975. During the period for which comparable data are available, the bottom water salinity in the DMDS, while higher than in the Galveston Channel by 3 to 5 ppt, displayed the same trends (Figure 15). It may, therefore, be assumed that the salinity over the DMDS was lower than 25 ppt and perhaps less than 20 ppt part of the time between November 1974 and June 1975, the period of time in which both fall and spring spawners should have reproduced. It is quite probable that the large population that occurred in April-May 1975 was a direct result of increased freshwater discharge into the Galveston Bay system and the resultant lowered salinities; however, the role of increased levels of river-borne nutrients acting to stimulate populations must not be overlooked. Between May and August the salinity in the Galveston Channel increased rapidly and the population underwent a precipitous decrease. It will also be seen in Figures 15 and 53 that freshwater discharge remained uniformly low during the fall and winter period of 1975 and 1976, and a repeat of the previous year's spring benthic population bloom did not occur. Henry's (1976) data showed a shortlived population increase in February, but neither the magnitude nor the areal extent of the increase can be assessed because too few control station data were available. Based on available data, it can be concluded that in most years, dredged material disposal would cause the least impact in the late summer or early fall prior to fall or spring spawning.

280. Previous studies concerning the impact of dredging have indicated that if water circulation was restricted, such as occurs in many marinas and waterfront housing developments, benthic populations may remain low (Reish, 1961; Taylor and Saloman, 1968; Sykes and Hall, 1970; Lindall et al., 1973; Gilmore and Trent, 1974); low oxygen levels caused by anaerobic conditions were often cited as the probable cause of the low populations. If water circulation was unimpeded, dredged areas and disposal areas have recruited climax communities (or at least populations comparable to control populations) within two months to

about four years (Reish, 1963; Virginia Institue of Marine Science, 1967; Pfitzenmeyer, 1970; Saila, Pratt, and Polgar, 1972; Stickney and Perlmutter, 1975; Harper and Hopkins, 1976). The passage of currents through the DMDS and the agitation of water by wind and waves make it unlikely that oxygen depletion would be but a very short-term environmental effect, occurring immediately after disposal occurred, and then principally after anoxic sediments had been dredged.

281. The greatest potential cause of change in the benthic community is a change in the sediment composition. Sykes and Hall (1970), Taylor and Saloman (1968), and Taylor, Hall and Saloman (1970), in part, equated low mollusk populations in dredged canals in Tampa Bay, Florida, with the fine sediments in the canals as compared with the firmer sediments on undredged shallows. Stickney and Perlmutter (1975), however, found that both the sediments and the benthic populations in a dredged portion of the Georgia Intracoastal Waterway were similar to a control area within two months after dredging occurred. Maurer et al. (1974) reported that some recruitment may have occurred at a disposal site in Delaware Bay within three months after disposal occurred.

282. In the present study, three disposal situations occurred: shell, sand, and silt-clay materials were deposited on a sandy bottom; sand and shell were deposited on a mud bottom; and silt-clay material was deposited on a mud bottom. Dredged material disposal in August-September coincided with a general population decrease, and an acute impact, if it occurred, was not evident at any disposal station. In the following months, the population trends at impacted stations were not similar. Beaumont Clay appeared to have a depressive effect at block 2 sandy bottom stations, while there was no apparent effect in block 14, which had a mud bottom. Sand and shell were deposited at station 12-3, but apparently much of the sand was eroded, leaving a shield of shell hash. The presence of large quantities of shell material at station 12-3 appeared to have a stimulative effect (both the diversity and the population increased) and this station clustered out separately by numerical analysis when all data were combined for analysis. When shell hash occurred at other stations the diversity also increased compared

with both sandy and muddy bottom control stations. The project was not continued long enough to determine the ultimate fate of the material comprising the disposal mounds or of the populations associated therewith.

283. The author places no significance on the inability of ANOVA to detect differences in populations or diversities within blocks. Only three samples were analyzed whereas analysis of pilot study data indicated that 10 samples would provide a better estimate of the population variability. There were, in many cases, extremely large variances in the populations at a given station, and most significantly, ANOVA cannot detect differences in the species comprising a population as numerical analysis can. Nor were background control data available for comparison.

284. The largest post-July populations and diversities occurred at stations where the bottom had been most altered by the disposal of dredged material containing shell. This obviously constitutes an impact or an effect, but the question of whether such an impact was deleterious is a philosophical one. It certainly can be argued that the bottom in the vicinity of buoy C was "improved" by the deposition of sand and shell; the disposal probably created numerous microhabitats that attracted species not normally found on a muddy level bottom.

285. It is quite likely that many of the benthic infaunal organisms were buried and killed each time dredged material was dumped. Some infaunal organisms might have migrated upward through loose sand or silt--Saila et al. (1972) reported that some polychaetes and bivalve mollusks survived burial under 21 cm of sediments--but it is not likely that the organisms buried under large masses of Beaumont Clay survived. Recolonization of the mounds probably occurred by migration of adults into the sites and by recruitment of planktonic larvae.

286. A profound problem in assessing the impact of dredged material that became apparent during examination of the data was whether dredged material had been moved from the primary deposition site in blocks 12 and 14 or whether winnowing of the fine sediments occurred, exposing underlying dredged material that predated this study. It was

possible, even probable, that some of the dredged material was moved from the main disposal mounds by wave and current action, by the wheel wash from deep draft vessels passing near the mounds, or by shrimp nets being dragged through the area. This explanation, however, does not account for several observed facts, viz: (a) dredged material was collected at station 12-1 in July before disposal occurred; (b) the volume of shell hash at station 12-3 alternately increased and decreased by large amounts after disposal occurred; (c) Beaumont Clay and shell hash were collected inshore and northeast of the disposal mound in both blocks 12 and 14 in January but not in March; and (d) large quantities of shell hash appeared at station 12-4 in May only. These observations suggest that fine silt and clay fractions may have been winnowed and redeposited with changes in the hydrodynamic regime, which uncovered and covered either existing disposal material or disposal material recently moved away from the main disposal mound. Extreme hydrodynamic conditions are required to suspend and transport shell material, making it unlikely that the shell hash was being transported about the disposal mounds. Winnowing may have been exacerbated by the presence of the disposal mounds themselves, which would have caused eddying in the currents flowing past them. Another possible explanation for the changes in sediment characteristics is station location error, but this was unlikely in the case of the samples collected adjacent to or in the vicinity of the buoys.

287. It is most unfortunate that the study was not conducted as originally planned. Six months to a year of predisposal data would have allowed the investigators to determine some of the natural changes in the sediment characteristics over time and to determine if the buoys had been placed in the proper location to adequately monitor the movement of sediments. Because of the manner in which the study was actually conducted, it was not possible to distinguish between the movement of dredged material away from the mounds and the uncovering and concentration of preexisting dredged material by currents and waves.

<u>Nekton</u>

288. The organisms collected by trawl were categorized as verte-

brates (finfish), nektonic invertebrates (mostly natant decapod crustacea) and benthic macroinvertebrates (including both motile epifaunal and sessile infaunal species). This was done especially to examine the effect of dredged material disposal on the benthic macroinvertebrates. While many of these latter organisms are motile, they lack the rapid mobility of fish and natant crustaceans and, thus, if repelled (or killed) by the dredged material, were less likely to be collected than nektonic organisms that might have been in transit across a deposit at the time of collection. The seasonal distributions of the organisms in each of the categories above are shown in Figures 64 through 78.

289. Benthic macroinvertebrates. The benthic macroinvertebrate populations (Figures 64 through 68) were quite large in July compared with the later collections. The hermit crab, *Pagurus pollicaris*, accounted for much of the large populations at all stations in July. Only the populations in block 14 showed an indication of increasing by the end of the study. No acute impact due to dredged material disposal was evident at any of the experimental stations.

290. The collection data for the benthic macroinvertebrates are summarized in Table 29. These data indicated that in September, while disposal was still occurring, two of three trawls in each of the experimental blocks contained no macroinvertebrates, whereas, organisms were present in all control station trawls. However, the populations in blocks 2 and 12 in November and January were both larger than in their respective control stations. The summation of all individuals collected at a given trawl station during the period September through May indicated a possible depressive effect of dredged material on the macrobenthic organisms. In each of the experimental blocks, trawl 2, which passed over the bottom impacted by dredged material, contained the smallest number of total individuals of the three trawls (in block 2, the difference between trawl station 2 and trawl station 3 was quite small). On the other hand, the total number of individuals collected in all three trawls combined was almost twice as great in the experimental blocks as in their respective control blocks, suggesting that the disposal areas were enriched. Statistical analysis indicated no signi-

ficant difference between the benthic macroinvertebrate populations within any block (Table 30).

291. Nektonic invertebrates. The seasonal distributions of the nektonic invertebrates are shown in Figures 69 through 73. The data summary appears in Table 31. All populations except those in block 15 followed the seasonal trend displayed by the benthos between July and November--a decrease from July through September and an increase in November. Thereafter, none of the population trends between blocks were similar, and in the case of block 15, the population trends within the block were not similar. The data indicated that large populations were collected in November in blocks 2, 12, and 27 only. However, the motility of the organisms makes such a conclusion untenable. No acute impact could be detected from the August-September disposal because the block 27 populations declined concomitantly with the experimental populations. After the February-March disposal in block 2, the populations in three blocks (2, 14, 27) decreased simultaneously.

292. The data summary (Table 31) indicated that in four of the five blocks, trawl station 2 had the lowest number of individuals of the three stations; two of the four blocks were control blocks. Only block 2 deviated from this pattern. It will also be seen that in none of the experimental blocks did trawl 2 catch uniformly lower numbers of individuals than did the other trawls. As with the previous group, there was *no* statistical difference between populations within any block (Table 30).

293. Vertebrates (fish). The seasonal distributions of the vertebrates are shown in Figures 74 through 78. The pattern described by the nektonic invertebrates was followed by the fish populations from July through November. However, after November there was not much similarity. No acute impact due to dredged material disposal was evident because all populations tended to decrease both in September and March. The data summary (Table 32) shows that in blocks 2 and 15, trawl station 2 had the lowest total number of individuals. In blocks 12 and 27, the trawl station 2 total was the highest of the three stations. There is no pattern in the bimonthly collections to indicate that any station in

a block was a more favorable area for the fish. There was no statistically significant difference between the fish population between stations within any block (Table 30).

294. Biomass. The trawl biomass data are summarized in Table 33. These data do not indicate that any station in any block had consistently lower biomass. Over the span of the study there was no indication that trawl station 2 in any experimental block was poorer in biomass than the other stations; trawl station 2 had the lowest biomass in blocks 2 and 27 and the highest in block 12.

295. Total populations. Statistical analysis indicated that there was a significant difference at the 95% level between total nektonic populations within control block 15 only (Table 30). Numerical analysis of the total trawl data produced a dendrogram with two clusters containing inshore (blocks 2 and 15) and offshore (blocks 12, 14, and 27) stations (Figure 79). The two clusters, however, were separated by a small ecological distance and should probably be considered two subclusters of one large cluster. There was no indication that any of the trawl stations located on dredged material had different populations than the other stations.

296. Experimental trawls in turbid water. The field personnel made comparative trawls in clear water and in the waters muddied by dredged material disposal in the vicinity of buoy D on 4 September 1975. These data (Appendix G) indicated that three species of fish, the croaker *(Micropogon undulatus)*, the star drum *(Stellifer lanceolatus)*, and the sea catfish *(Arius felis)*, were definitely concentrated in the turbid waters. It is probable that the sea bob *(Xiphopeneus krøyeri)* was also concentrated in the muddy water. The biomass from the trawl tow through the turbid water was much greater than in the clear water either before or after the disposal of dredged material.

297. Fish stomach content analysis. The working assumptions when examining the fish stomach content data were: (a) that all the fish sampled were from one large population that inhabited not only the DMDS, but also the general nearshore bottoms and lower Galveston Bay; (b) that the fish moved freely about this general area responding to abiotic

factors such as salinity and turbidity rather than to the presence or absence of dredged material; and (c) that the fish were opportunistic feeders (within their food preference) wherever they happened to be. Therefore, it should not be possible to detect any effects on the food habits of fishes that could be attributed to the presence of disposed dredged material. These were essentially the same conclusions made by Henningsen (1977) in his study of the nektonic populations in the vicinity of the DMDS.

298. The numbers of individuals selected each month for stomach content analysis are shown in Table 34 (raw data are presented in Appendix G). Theoretically, 900 fish stomachs should have been examined (10 stomachs/trawl × 15 trawls/bimonthly sampling × 6 bimonthly samplings). It was not always possible to select 10 fish from every trawl either because of small sample size, or it was not practical because the fish were juvenites; only adults and young were selected for stomach content analysis.

299. Of the 582 fish stomachs examined, 154 (26%) were empty or had only minute traces of food material. The greatest total percentage of empty stomachs occurred in January (Table 35); the fish may have been torpid and not feeding as actively as in other months. The largest single percentage of empty stomachs (80%) occurred in January at trawl station 12-2, which passed over the disposal site in block 12. The empty stomachs were not due to a paucity of benthic invertebrates available as food; benthic station 12-3 had the second largest population of benthic macrofauna in block 12 in January.

300. Two hundred thirty-six stomachs (40.5%) were full (Table 36). The term "full" is anatomically correct, but perhaps ecologically misleading; in may cases one small food item, e.g. a polychaete or a crab, filled a small stomach. Over the period of the study, the percentage of full fish stomachs was similar at all stations for which adequate data were available.

301. If it is assumed that the fish were feeding as they ranged over the bottom, then it would be probable that some fish would have food items in their stomachs that were not collected in the area in

which the fish were collected. The identifiable species removed from fish stomachs were compared with the potential food species collected by core and trawl at the same location. In most cases, the benthic species found in fish stomachs were widespread in the DMDS, and it was not possible to determine where feeding had occurred. There were, however, several instances of species being eaten that were not collected in the block from which the fish were collected (Table 37). Of particular interest were specimens of the bivalve mollusk, *Mulinia lateralis*, which were recovered from the stomachs of fish collected in blocks 14 and 27. *Mulinia* is a sandy to sandy mud bottom dweller (Moore, 1961; Harper, 1970). All specimens collected by corer during the present study, save one, occurred at the sandy bottom stations in blocks 2 and 15; none were collected from blocks 14 or 27. Twenty-five specimens of *Mulinia* were found in the stomach of one spot *(Leiostomus xanthurus)*. *Leiostomus* was most common in blocks 2 and 12; the only specimen collected in block 14 had the 25 *Mulinia* in its stomach. Other *Mulinia* were taken from stomachs of tonguefish (*Symphurus civitatus)*, a fish that was present in all blocks in about equal numbers over the span of the study.

302. One other benthic species, the polychaete annelid, *Anaitides erythrophyllus*, was eaten by a threadfin *(Polydactylus octonemus)* trawled from block 27. *Anaitides* was never collected by spade corer from block 27. It was most abundant in the inshore bottoms of blocks 2 and 15, and at station 12-3, which received sand-shell dredged material.

303. Discussion. In the laboratory, freshwater fish (Wallen, 1951) and marine fish (Ingle et al., 1955; O'Connor and Sherk, 1975) have been killed by being subjected to concentrations of suspended mud dense enough to clog their gills. The lethal concentrations were often considerably in excess of levels that can be maintained in natural conditions except as dense, relatively thin mud flows along the bottom in the vicinity of an operating dredge (Masch and Espey, 1967; May, 1973). O'Connor and Sherk (1975) suggested that the species of fish more tolerant of dense mud concentrations in the laboratory were those

that spent most of their lives associated with the mud-water interface.

304. Histological studies have indicated damage to fish gills, such as thickening of the gill lamellae (Southgate, 1960), fusion of the gill lamellae epithelial cells (Jones, 1962), and increased concentrations of mucus-secreting cells and a deterioration of the gill lamellae (O'Connor and Sherk, 1975). However, field studies of free-living populations of fish in areas subjected to sedimentation in the Georgia Intracoastal Waterway (Stickney, 1972), Mobile Bay, Alabama (Ingle, 1952), Chesapeake Bay (Flemer et al., 1968; Ritchie,1970), and Texas (Harper and Hopkins, 1976) have indicated no adverse effects attributable to suspended material. Ritchie (1970) and Flemer et al. (1968) placed caged fishes in the mud plume from an operating dredge and could detect no gross injury or gill damage attributable to sedimentation. Saila, Pratt, and Polgar (1972) cited several examples of tests wherein fish and lobsters subjected to suspended sediments experienced no significant mortalities. It was the author's observation in San Antonio Bay, Texas, that many finfish and nektonic crustaceans tended to congregate in turbid water regardless if it was dredge-created or natural turbidity. They also displayed a very pronounced tendency to avoid clear water. Harper and Hopkins (1976) speculated that this movement into turbid water provided protection for the migrant from sight-feeding predators. Evidence for this was provided by Kroger and Guthrie (1972) who showed that juvenile menhaden in muddy bays had higher survival rates and fewer injuries due to predators than ones in clear bays. Viosca (1958) also observed a tendency for nektonic organisms to congregate near operating dredges.

305. Available field data do not indicate that dredged material disposal or creation of turbid water are harmful to nekton. Changes in nektonic populations in areas affected by dredging or disposal have been attributed to seasonality of the populations and to hydrographic factors rather than the dredge-related effects (Flemer et al., 1968; Ritchie, 1970; Stickney, 1972; Henningsen, 1977; and this study). This is not surprising in view of the natatory ability of the nekton. It is well known that many fish leave the Texas bays and migrate into deeper

offshore water to escape cold water temperatures in the winter. If an avoidance reaction of this magnitude can occur, it should be comparatively simple for a nektonic organisms to avoid a slow-moving, dense mud plume caused by dredge-related activities. O'Connor and Sherk (1975) stated that exposure of fish to highly turbid water resulted in violent escape behavior, viz: "sidling" in the corners of the tank, leaping from the water, "coughing", and rapid swimming into the sides of the tank.

306. The validity of conclusions drawn from experiments subjecting fish to dense concentrations of mud is questionable at best. The smallest concentration of Fuller's earth to cause mortality in any species tested by O'Connor and Sherk (1975) was 510 mg/ℓ. May's (1973) field study in Mobile Bay, Alabama, showed that on a level bottom, suspended particle concentrations in the watery mud density flow from a continuously operating shell dredge approached 200,000 mg/ℓ. This layer, however, was only about a metre thick at most. Above the density flow, the suspended particle concentration was less than 500 mg/ℓ. In the present study, Bouma et al. (1976) monitored several disposal operations. The maximum suspended particle concentration recorded was 120 mg/ℓ at the bottom of the water column; in most monitoring studies the largest concentrations recorded were in the 35-55 mg/ℓ range or less. These were considerably lower concentrations of mud than investigators have used to kill fish.

307. In the case of benthic invertebrates, whether motile epifauna or infauna, a sudden cascade of dredged material probably buries some individuals. It is possible that the pressure wave that precedes any object falling through the water would sweep some of the lighter epifaunal organisms in the impact zone toward the periphery of the zone and enhance survival, but most individuals are probably buried. It is likely that some burrowing organisms migrated upward through the sand-shell or fine mud disposed in the DMDS. Saila et al. (1972) have shown that large burrowing polychaetes and bivalves have survived burial beneath 21 cm of sediments. It is not likely that anything buried under the mound of Beaumont Clay at buoy D survived. There was, however, no

indication that the dredged material caused any change in the macrobenthic populations; changes were apparently due to seasonal variations. It is quite likely that sudden cold waves and other severe environmental changes (Part III) do more damage to the nektonic and benthic macroinvertebrate populations than the disposal of dredged material. It is also probable that far more fish are killed when they are caught by commercial shrimpers than by any dredge-related impact.

308. In their study of the food habits of fishes in San Antonio Bay, Texas, Dineen and Darnell (1973) obtained results similar to those found in the present study. The fish ranged over most of the bay, and it was not possible to determine where they had fed in most cases. One striking exception was the occurrence of large numbers of juvenile specimens of a low salinity snail (*Littoridina sphinctostoma*) in the stomachs of bay anchovies (*Anchoa mitchilli*). The anchovies were collected by trawling through the mud plume from a shell dredge operating about midway down the bay. *Littoridina* was common near the head of San Antonio Bay but was rarely collected in midbay. It was obvious that the anchovies had migrated almost 10 km from their feeding location at the head of the bay to the area in which they were collected. Dineen and Darnell (1976) subsequently implied that the mud plume from the operating dredge caused a shift in the feeding habits of the anchovies.

309. Henningsen (1977) determined that the fish he examined had been feeding throughout the nearshore area and lower Galveston Bay.

Zooplankton

310. The raw zooplankton data from the NMFS archival data and the data from the present study may be found in Appendix H.

311. NMFS archival plankton data. During the 2.25-yr sampling period at station W53, the total zooplankton population exhibited fairly regular annual cycles (Figure 80) with population increases occurring in the spring (March-June) and fall (September-October); the months of the spring increases varied more than did the months of the fall increase, possibly because of annual variations in abiotic factors. The spring peaks were much larger in 1964 and 1965 than the 1964 fall peak. If a large spring population did occur in 1963, it was missed, either by

the sampling schedule (note the 6-week hiatus between March and May and between May and July) or by sampling error (note the unusually low population in March 1963, between two larger values).

312. The population of the meroplanktonic component is compared with the total zooplankton population in Figure 80 (the holoplanktonic component is not graphed, but may be inferred). The meroplankton exhibited a moderate summer increase in 1963 and large increases in the springs of 1964 and 1965. In the latter year, the meroplankton comprised 52% and 59% of the total zooplankton population in March and April, respectively, whereas the meroplankton usually constituted 20% or less of the total population.

313. The principal components of the meroplanktonic and holoplanktonic populations are listed in Table 38. Copepods, particularly the calanoids (see Table H2), dominated the holoplankton in all collections. The larval forms of benthic invertebrates comprised most of the meroplankton (fish eggs and larvae were included in this category but were always a minor constituent). Barnacle nauplii and cypris larvae were abundant in some spring samples, but because there were few hard substrates in the DMDS on which to settle, they were of minor importance in repopulating disrupted bottoms. The three important groups in the meroplankton were the young of polychaete worms, mollusks (principally snails and clams), and crustaceans (mostly various types of crabs and shrimp), which live on or burrow into the bottom (Figure 81). Polychaete larvae were most abundant in the spring of 1963 and 1965 and in the summer of 1964. The larval mollusk population peaked in the summer of 1963, the spring and fall of 1964, and the spring of 1965. Mollusk larvae were present in large numbers compared with other meroplanktonic forms. Crustacean larvae were present in the plankton principally between May and October.

314. Monthly DMDS data. The trends in total zooplankton abundance at stations in the entrance channel station and the DMDS station are compared in Figure 82. The channel population was larger than the DMDS population in all months. The population trends between July and November did not correspond with the fluctuations described above for

station W53. The July and August populations were much higher than those at station W53, due partly to larger numbers of cladocerans (Table 39). There was no evidence of a fall increase in the total zooplankton crop.

315. The total numbers of meroplankton were virtually unchanged throughout the five-month study (Figure 82). Mollusk larvae were abundant in most collections (Figure 83). Crustacean larvae were most abundant in September and October.

316. Texas City disposal data. During the Texas City Channel material experimental study, three zooplankton tows were made: one immediately before disposal, one in the mud plume, and one after the mud plume had dispersed. The number of individuals per m^3 of water filtered are shown in Table 40. The pre- and postdisposal samples contained similar numbers of individuals while the population sampled in the mud plume was apparently depressed by about 46%.

317. Table 40 compares the percent composition of the taxonomic groups in the three samples. The percentages of the various meroplanktonic groups were similar in all three collections even though the absolute numbers might be dissimilar

318. The percentages of some holoplanktonic components changed during and after disposal even though the total percentage of holoplankton was similar in all three collections. The percentage of protozoans increased from the first tow to the last; the copepod percentage decreased in the postdisposal tow; and the urochordate percentage decreased in the mud plume collections.

319. Discussion. The species composition of samples collected during the present study was similar to those of NMFS samples collected 10 to 12 years prior and to nearshore samples collected off Matagorda Island, Texas (Park, 1975b). Even the order of abundance among the more common species was quite similar among the three studies.

320. Data from the NMFS plankton samples as well as other multiyear studies in Texas (Rennie, 1975), Florida (Hopkins, 1966), and along the U. S. East Coast (Bigelow and Sears, 1939; Stickney, 1959; Deevey, 1960) have indicated that variability should be expected with respect to

seasonality and abundance of the total zooplankton population or any component thereof. The objective of the zooplankton study for this project was to determine when the larvae of benthic invertebrates would be available to repopulate freshly deposited dredged material. This cannot be done with any degree of exactness in the Galveston area and probably is not feasible along most of the Gulf coast. The seasonal larval maxima are probably dependent both on abiotic factors (temperature, salinity, etc.) and on biotic factors (phytoplankton blooms, predators, competitors) that vary from year to year. Gillespie (1971) reviewed the recent literature concerning the relationship between zooplankton and various environmental factors and concluded that salinity appeared to be the chief factor controlling the species present (cf. the macrobenthic discussion, this chapter), while temperature, predation, etc. controlled the number of individuals present.

321. Field studies on the effect of suspended sediments on zooplankton are wanting. In Chesapeake Bay, Flemer et al. (1968) collected zooplankton samples two weeks prior to the beginning of dredged material disposal, during disposal, and four days after disposal. No gross effects due to disposal could be detected.

322. During the Texas City material experimental study, the standing crop was apparently reduced by about 46% while the water was highly turbid, but returned to predisposal levels within 30 min after disposal occurred. In particular, the copepod, chaetognath, and urochordate populations were greatly reduced in the in-plume sample compared with the pre- and postdisposal samples. It is possible that the reduction in numbers was due to the zooplankton being carried to the bottom by the load of dredged material. However, the protozoan population, which consisted mostly of *Noctiluca scintillans*, increased greatly in the postdisposal samples, a fact that is difficult to attribute to the disposal operation and is probably due to patchiness in plankton distribution.

323. The changes in numbers of individuals of the dominant holoplanktonic groups are probably not significant for several reasons. The efficiency of the net may have decreased between the first and last

samples due to silt clogging some of the openings. If the net clogged with silt while the in-plume tow was being made, the backwash from the net may have caused the flowmeter to reverse position and continue to record, giving an erroneously high reading and apparently reducing the number of individuals. The in-plume sample was very difficult to analyze because of the high silt content, and many organisms could have been overlooked. Also, there was insufficient time to collect replicate samples during each of the three phases of the study.

324. Referring to the pilot study plankton data (Table 8), it can be seen that four samples were collected. These samples were close enough in time and space to be considered four replicate samples from the same location, yet there was considerable variation in the numbers of individuals of the two numerically dominant taxa, the Copepoda and the Chaetognatha. Park (1975b) also recorded great variability between some replicate samples collected in South Texas shelf waters; in a few cases, the percent difference between numbers of individuals in his replicates was greater than between the experimental disposal samples.

325. The zooplankton populations in the DMDS are highly transient, continually being carried away and replaced by currents. It would be very difficult to detect any permanent zooplankton population reduction in the water mass unless the investigator was able to follow the plume as it dispersed and take plankton samples at intervals. However, this is probably not practical because of the problems associated with analyzing samples collected from muddy water.

326. O'Connor and Sherk (1975) subjected the copepods *Acartia tonsa* and *Eurytemora affinis*, both filter feeders, to dense concentrations (500 mg/ℓ) of natural silt. The filtration rate of *Acartia* decreased and remained low while that of *Eurytemora* was initially depressed but returned to control levels after three hr. It was hypothesized that *Eurytemora*, a "true estuarine form common in the turbid oligohaline and freshwater sectors of estuaries," was stimulated to begin or increase its feeding rate under turbid conditions whereas *Acartia* that "inhabits generally less turbid waters" reduced its feeding rate in response to high levels of turbidity. Darnell (1961) stated

[and Cuzon du Rest (1963) agreed] that the greatest abundance of copepods, of which *A. tonsa* was the major representative, was found in areas "characterized by mixing of water masses, bottom roiling, and proximity to eroding marshes," a description that does not connote reduced turbidity. *Acartia tonsa* is known to be the dominant zooplankter in much of the Galveston Bay system that is highly turbid most of the time (personal communication, G. A. Matthews, T. J. Minello, 1977, Texas A&M Marine Lab, Galveston). High turbidity *per se* might not reduce feeding rates, for *A. tonsa* normally inhabits highly turbid water in the Galveston area. The decrease in feeding rates found by O'Connor and Sherk (1975) may have been due to unnaturally high turbidity.

Phytoplankton

327. Monthly phytoplankton data. The temporal trends in phyto- [illegible]n pigment concentrations at the entrance channel and the DMDS [illegible] are depicted in Figure 84 (raw data in Appendix I). Except for the relatively high value in the bottom water samples collected from the September DMDS station, all data indicated a trend of decreasing pigment concentrations through the fall. Uniformly low values occurred in October and November, followed by a slight increase in December. Figure 85 depicts the temporal pigment concentration trends found in the DMDS; predisposal collection pigment values obtained during the experimental studies have been included. This figure indicates that the high value present in September may have been sustained into early October.

328. Experimental phytoplankton data. During the disposal operations conducted on 9 September and 9 October 1975, there was an apparent decrease in phytoplankton pigment concentrations compared with predisposal values (Tables I2 and I3). The decrease, however, was not large. During the second disposal on 9 October, samples were taken periodically after the hopper load of Texas City Channel material was released (Figure 86). The erratic pattern suggested by the data indicated that sampling error may have been large, perhaps large enough to mask any decrease in productivity due to turbid water. The turbidity in the surface water had dissipated (as determined visually) within 10 min after disposal occurred and the bottom water had cleared within about 50

min.

329. Discussion. The temporal trend described above is somewhat similar to the trend observed in East Lagoon, Galveston, by Zein-Elden (1961). During her study, which continued for 1.5 yr, the pigment concentration at the station closest to Bolivar Roads increased in October (fall bloom), then decreased through December or January before increasing again during the spring bloom. A spring minimum was recorded following the spring bloom, and oscillations occurred during the summer before the early fall bloom. Inasmuch as the trends observed by Zein-Elden recurred over the 1.5-yr study, it is probable that the same general trend will recur annually, allowing for temporal variations caused by annual differences in temperature, turbidity, nutrient levels, and other environmental factors.

330. In other studies along the northwestern Gulf coast, Freese (1952) recorded a January-March bloom in the Rockport, Texas, area and a second bloom in June and July. McFarland (1963b) found that plankton productivity in the surf zone off Mustang Island, Texas, decreased from October through December and then increased slowly through the following October; a spring bloom was not evident. Van Baalen (1975) reported that the nearshore waters over the South Texas continental shelf contained higher, often much higher, pigment concentrations in April-May samples than in January-February or August-September samples, which suggested a late spring bloom. Offshore the pigment concentrations were uniformly low. Thomas and Simmons (1960) found that pigment concentrations were larger in May than during September-November in the Mississippi Delta region.

331. With one exception, the total pigment concentrations collected during the present study were less than 0.7 mg/m^3. These values were somewhat lower than the values recorded by Van Baalen (1975) at nearshore stations in South Texas and were considerably lower than the values recorded by Zein-Elden (1961) in the East Lagoon (mean of 15.25 mg/m^3) and the values recorded from Texas estuaries by Odum, McConnel, and Abbott (1958). The values reported by Steidinger (1973) from the west coast of Florida were also higher.

332. Figures 84 and 85 also show thaat a given station, pigment concentrations at the bottom of the water column were often greater than at the surface. This may have been due to suspension of benthic diatoms into the water column by wave agitation; the literature reviewed by Raymont (1963) indicated that bottom-dwelling diatoms and other photosynthetic organisms can contribute significantly to the organic production of shallow waters.

333. The high bottom water pigment values recorded in September-October in the DMDS occurred during and just after dredged material disposal; it is not known if there is a relation between these two observations.

334. While the pigment data suggest a seasonal decline in pigments, the results are questionable. Collecting samples only once each month may lead to incorrect conclusions, especially when the study covers only a short period of time. Samples were collected more frequently in both Zein-Elden's (1961) and McFarland's (1963b) studies. In both of these studies, the measured pigment values tended to vary considerably from collection to collection. Thomas and Simmons (1960) reported that as much as a sevenfold increase or decrease in pigment values could occur from one day to the next at a given station. It is quite probable that the recorded values of this study would have been different if samples had been taken on different days or even on different stages of the tidal cycle. Flemer et al. (1970) conducted diel studies in Chesapeake Bay and found that the variability from hour to hour could be as much as 20 mg/m^3.

335. It is known that phytoplankton production in turbid waters is reduced compared with clear water in the same locality due to a reduction in light intensity (Raymont, 1963). The laboratory work of O'Connor and Sherk (1975) indicated that up to an 80% reduction in production occurred at concentrations of suspended particles "observed in the vicinity of dredging operations as well as during estuarine flood conditions." Flemer et al. (1968) and Flemer (1970) reported that during dredging, production in turbid areas of Chesapeake Bay was reduced to about one-third of predredging levels; ambient conditions

were reestablished within several hours after dredging ceased. A study conducted in Alabama by Vittor (1972, 1973) indicated that the density of phytoplankton cells sometimes increased during dredging operations. It is unlikely that production increased while the turbidity was high; the larger number of cells was more likely due to sampling error or to benthic unicells being resuspended by dredging.

336. During the present study, apparent phytoplankton pigment decreases occurred while the mud plume from dredged material release passed through the monitoring area. The postdisposal trends in pigment concentrations do not permit an accurate assessment of whether the decreases were due to turbidity or to natural fluctuations in the population (patchiness). If the assumption is made that productivity decreased during the time period before the silt plume dispersed, it is questionable whether the decreased production materially affected the organic material available for higher trophic levels. The phytoplankton populations at a fixed point are continually being replaced by current movement; a new flora will be available to the higher trophic levels as the current disperses the mud plume. The DMDS, while offshore from Galveston, is very much a part of the estuarine Galveston Bay complex, being under the influence of waters emerging from the bay during ebb tide. The organic content of the water may be high from riverborne material and from macrophyte production along the bay margins. Also, wave-generated turbidity, often quite as thick as the visible mud plume from dredged material disposal, persists for hours or days instead of less than an hour at a specific site, and probably effects a decrease in production.

PART VIII: CONCLUSIONS AND RECOMMENDATIONS

337. The DMDS offshore from Galveston lies in the path of water being discharged from Galveston Bay and thus has an estuarine environment for at least part of the time. The lack of abiotic stability probably causes constant population changes among the resident biota, similar to the fluctuations observed during this study. The bottom of the DMDS graded from inshore sand to offshore mud; the benthic and nektonic populations tended to cluster into inshore and offshore groups corresponding to substrate types.

338. The benthic populations in the DMDS were diverse and highly variable. The variability among replicate samples at a given station is attributed to small-scale areal variability in sediment characteristics that were detected during the analyses of sedimentological data.

339. Dredged material disposal did not cause an identifiable acute impact on the benthos but may have caused alterations in benthic populations subsequent to disposal. The affects included an apparent population depression when Beaumont Clay was deposited on a sandy bottom and an apparent stimulation when sand and shell material were deposited on a soft mud bottom. In the latter case, the population increases were due to a few sandy bottom-dwelling species that apparently took advantage of the new habitat.

340. There was no significant difference between populations in any block through time. This is attributed to inadequate sample size and the great variability in the benthic populations. The lack of correlation between benthic populations and sediments is attributed to the wide variability in both sediments and populations.

341. According to Henry's (1976) data, the benthic populations in the ship channel were reduced by dredging. This is to be expected because the habitat was being removed. The populations began to recover as soon as sediments began to accumulate in the channel bottom.

342. The magnitude of the effect on the benthic populations could not be accurately determined. Adequate predisposal data on sediment and benthic population temporal changes were not available for comparison.

The lack of spatially controlled sediment data did not permit an accurate assessment of whether dredged material was being eroded from the mounds, or if the appearance and disappearance of dredged material at stations peripheral to the mounds was caused either by movement of dredged material or by alternate winnowing and accumulation of sediments with changes in the hydrographic regime. It is strongly recommended that future projects of this type continue for a year to produce the necessary baseline information (lacking herein) before the experimental studies begin.

343. Any impact on the benthos can probably be reduced if dredging and disposal occur when the populations are declining or low. This optimum period may vary from year to year, depending on environmental conditions, but should occur most often in late summer or early fall (August-October). The fall spawning period is likely to occur within this period and larvae of benthic organisms will be available to recolonize newly deposited dredged material.

344. Dredged material deposits had no apparent effect on the distribution of nekton or on the feeding habits of fish. Some nektonic species apparently tended to congregate in water made turbid by dredged material disposal. Zooplankton and phytoplankton studies conducted while disposal occurred detected no effects that could not be attributed to sampling error. Because of the problems associated with collecting and analyzing zooplankton and phytoplankton samples from highly turbid water, it is recommended that extensive field studies not be conducted on the effects of dredged material disposal on zoo- and phytoplankton during future studies of this type.

345. Whatever the biotic effects caused by the physical acts of dredging and dredged material disposal, they may be insignificant when compared with the devastation caused by sudden abiotic changes such as floods, freezes, etc., or even the destruction of biota by commercial fishing activities.

346. It is also recommended that, in the Galveston area, dredged material be disposed closer inshore and to the southwest of the present disposal site. The higher wave and current energy inshore would allow

greater winnowing of fine materials and produce a source of coarse sediment for beach nourishment.

347. This field study was beset with numerous logistic and sampling problems. The problems were compounded by the failure of the Galveston District to inform the investigators and WES of dredging schedules. It is strongly recommended that communication between different branches of the same agency be improved to prevent similar problems from recurring. It is also recommended that in future studies dredge crews be made acutely aware of the necessity of disposing dredged material in the proper location.

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Table 1

Summary of the Temperature Data (°C) from Galveston 1931-1960 (after SEADOCK, 1975). Extreme Maxima and Minima are for a Period 1871-1971

Month	Monthly Average	Average Daily Maximum	Extreme Maximum and Year	Average Daily Minimum	Extreme Minimum and Year
January	12.7	15.8	25.0 (1969)	9.6	-11.7 (1886)
February	13.8	16.9	28.3 (1932)	10.7	-13.3 (1899)
March	16.3	19.2	29.4 (1879)	13.6	- 2.8 (1943)
April	20.3	22.8	33.3 (1953)	17.8	3.3 (1938)
May	24.3	26.7	33.8 (1911)	21.9	11.1 (1954)
June	27.6	29.8	37.2 (1918)	25.4	13.9 (1903)
July	28.4	30.7	38.3 (1932)	26.1	18.9 (1910)
August	28.5	30.8	37.8 (1924)	26.1	19.4 (1966)
September	26.7	29.2	35.6 (1927)	24.1	11.1 (1942)
October	23.1	25.8	34.4 (1952)	20.2	5.0 (1925)
November	17.2	20.3	29.4 (1886)	14.1	- 3.3 (1911)
December	14.0	17.1	26.6 (1918)	10.9	- 7.8 (1880)
Annual	21.1	23.8	38.3 (1932)	18.4	-13.3 (1899)

Table 2

Comparison of the Average Monthly Temperatures (°C) in the Galveston Channel: 1922-1949 and 1950-1975

Month	1922-1949	1950-1975	Δ°C
January	13.7	12.4	-1.3
February	14.7	13.6	-1.1
March	17.3	16.3	-1.0
April	21.8	20.9	-0.9
May	25.8	25.3	-0.5
June	29.0	28.4	-0.6
July	30.3	29.8	-0.5
August	30.5	29.9	-0.6
September	28.8	28.1	-0.7
October	24.8	24.1	-0.7
November	19.2	18.5	-0.7
December	15.4	14.1	-1.3

Table 3

The Average January Galveston Channel Water Temperature (°C) in 10-Year Intervals Between 1926 and 1975

Intervals	Average Temperature
1922-1928	14.8
1929-1938	14.7
1939-1948	11.9
1949-1958	13.8
1959-1968	11.1
1969-1975	12.5

Table 4

Comparison of Monthly Salinities (ppt) in the Galveston Channel:

1922-1949 and 1950-1975

Month	1922-1949	1950-1975	Δ ppt
January	21.8	24.4	+2.6
February	20.9	24.2	+3.3
March	20.8	24.3	+3.5
April	20.8	23.0	+2.2
May	19.7	21.3	+1.6
June	20.4	23.0	+2.6
July	25.1	26.7	+1.6
August	29.7	29.8	+0.1
September	27.2	26.9	-0.3
October	24.8	24.7	-0.1
November	24.6	25.9	+1.3
December	23.3	26.1	+2.8

Table 5

Summary of Benthic Data from Each Station in the Offshore Dredged Material Disposal Area Sampled During the Pilot Study

	Stations													
	1	2	3	4	5	6	7	8	9	10	11	12	13	14
Hemichordata			10.7	53.8	72.2	44.7	91.1		4.3			82.3	36.8	84.0
Polychaeta	23.6	61.2	56.3	27.4	19.4	36.8	6.2	49.4	23.5	66.7	64.9	11.8	39.9	4.7
Nemertea	2.4	7.1	13.6	12.3		7.9	1.4	4.9	3.8	12.1	13.5	5.4	15.8	2.0
Crustacea	23.5	10.5	1.0	5.7			0.3	3.7	2.5		6.8		3.7	5.2
Mollusca	2.4	8.2	11.7	0.9	5.5	10.5	0.2	7.4	7.6	7.6	5.4	0.3	3.7	2.9
Echinodermata		1.2					0.2		0.3	1.5	5.4	0.3		
Phoronida	36.5	9.4					0.2	32.1	47.0	4.5	4.1			0.7
Sipunculida	1.2	1.2	6.8		2.8		0.6		1.8	1.5				0.5
Echiurida	3.5													
Anthozoa	5.9							2.1						
Misc.	1.2									6.0				
Total #spp.	20	23	23	21	9	10	30	18	39	21	27	19	22	32
$\bar{X}$ #ind/m^2	680	680	824	848	288	304	9064	648	3150	528	592	2984	1069	3256

	15	16	17	18	19	20	21	22	23	24	25	26	27	28
Hemichordata			13.6		94.5	86.9	19.7	0.4	76.1	64.0	30.5	78.4	71.4	84.9
Polychaeta	61.2	45.2	59.1	68.4	4.6	9.1	66.2	39.5	16.5	16.7	53.7	16.2	19.0	10.4
Nemertea	9.7	20.5	10.6	21.1	0.9	3.4	7.7	4.7	2.6	1.7	11.0	3.5	4.8	1.5
Crustacea	5.9	3.0	3.0	5.3		0.6	3.5	5.9	1.0	12.3	2.4	1.0	1.6	1.7
Mollusca	14.1	2.3	4.6				1.4	20.9	1.4	4.5		0.6	3.2	0.5
Echinodermata	0.8		1.5					5.5			1.2			0.7
Phoronida	2.2	27.8					1.4		0.5					
Sipunculida	3.0	0.8	7.5	5.3				0.8	1.4	0.9				0.5
Echiurida	2.2							24.1				0.3		
Anthozoa	0.8	0.4							0.5		1.2			
Misc.														
Total #spp.	39	34	22	8	14	9	27	34	27	18	16	23	14	22
$\bar{X}$ #ind/m^2	1072	2072	528	152	5704	1408	1136	2024	3352	912	656	2520	1512	3224

* Listed are percent composition of each major taxonomic group, total number of species, and average number of individuals per m^2.

Table 6

Eigenvectors for the Principal Components in the Analysis of Pilot Study Abiotic Data

The Most Important Eigenvectors in Each Column are Underlined

	Station											
	1	2	3	4	5	6	7	8	9	10	11	12
MEAN % DRY WEIGHT	0.70	0.41	-0.10	0.23	-0.06	0.18	-0.11	-0.06	-0.25	0.22	0.29	0.09
PH	0.22	0.58	0.24	0.36	0.15	0.11	-0.37	0.27	-0.35	-0.03	-0.13	-0.20
SULFIDE MG/KG	-0.39	-0.57	-0.14	0.40	-0.29	0.11	-0.16	0.29	0.16	-0.04	-0.03	-0.13
EH	-0.03	-0.06	-0.12	0.85	-0.01	0.29	0.10	0.14	0.17	0.10	-0.08	0.17
MANGANESE MG/KG	-0.42	-0.56	-0.25	0.05	0.52	0.04	0.07	0.14	-0.12	0.30	0.03	-0.06
ZINC MG/KG	-0.33	0.52	0.48	0.05	0.11	-0.12	0.46	-0.03	-0.17	0.14	-0.28	-0.07
CHROMIUM MG/KG	-0.64	0.49	-0.41	-0.18	0.05	0.12	-0.01	0.14	-0.21	-0.14	0.08	0.02
CADMIUM MG/KG	-0.19	0.63	-0.52	-0.16	-0.09	-0.17	-0.10	0.07	0.25	0.24	0.07	-0.14
NICKEL MG/KG	-0.51	0.34	-0.42	0.28	0.21	-0.40	-0.01	-0.08	0.12	0.24	-0.11	0.05
LEAD MG/KG	-0.12	-0.45	-0.30	0.34	0.47	-0.19	0.10	-0.39	-0.16	-0.19	0.13	-0.18
COPPER MG/KG	-0.84	0.27	0.22	-0.06	-0.12	-0.06	-0.08	0.13	-0.01	0.09	0.19	-0.17
IRON G/KG	-0.22	-0.45	0.74	0.27	-0.10	-0.14	0.16	0.11	-0.03	0.07	0.19	-0.07
PHOSPHORUS G P/G SED	-0.19	-0.23	0.53	-0.44	0.21	0.31	-0.31	-0.19	0.13	0.27	-0.05	-0.02
MERCURY MICROG/KG	0.09	0.38	0.29	0.04	0.69	-0.03	-0.17	0.21	0.34	-0.28	0.03	-0.02
ARSENIC MG/KG	-0.05	0.72	0.47	0.33	-0.06	-0.04	0.16	-0.20	0.17	-0.02	0.17	0.04
ORGANIC NITROGEN MG N/KG	-0.68	-0.32	0.18	-0.14	-0.14	-0.47	-0.01	0.31	-0.05	0.02	0.04	0.03
AMMONIUM MG N/KG	-0.60	0.14	-0.22	-0.13	-0.10	0.47	0.44	0.03	0.12	-0.06	0.04	-0.25
SHELL-CARBONATE PHI	0.63	-0.01	-0.00	-0.25	0.43	0.10	0.32	0.38	0.01	0.10	0.14	0.13
SAND %	0.98	-0.07	-0.03	-0.01	-0.03	-0.04	0.05	0.03	0.04	0.05	-0.05	-0.14
SILT %	-0.90	0.01	0.15	0.15	0.08	0.05	-0.16	-0.21	0.10	0.06	0.07	0.01
CLAY %	-0.94	0.10	-0.05	-0.07	0.00	0.02	0.02	0.07	-0.12	-0.10	0.04	0.20
AVERAGE PHI	-0.88	-0.13	0.01	0.02	0.15	0.26	-0.08	-0.10	-0.08	0.07	-0.05	0.05
MEDIAN PHI	-0.96	0.12	0.04	-0.04	0.01	0.08	0.02	0.01	-0.06	-0.12	-0.04	0.13

Table 7

Percent Composition of Species Collected by Trawl in the Dredged Material Disposal Site at Each Pilot Study Trawl Station with Data Summary Listing Numbers of Species and Individuals of Nektonic Components

	Stations								
VERTEBRATES	1	2	3	4	5	6	7	8	9
Micropogon undulatus	25.6	22.9	38.9	51.5	22.9	20.5	61.4	69.9	19.7
Stellifer lanceolatus	25.0	19.8	24.7	22.7	2.6	0.9	1.3	1.4	0.9
Polydactylus octonemus	6.0	10.8	0.4	3.6	1.3	2.3	1.4		2.4
Cynoscion arenarius	4.7	11.9	7.2	8.3	6.5	1.6	2.8	0.4	1.6
Larimus fasciatus	0.9	0.9	0.1	0.4			0.5	0.2	0.2
Symphurus civitatus	0.7	1.3	4.9	0.4	11.5	5.8	5.5	8.2	17.5
Anchoa mitchilli	0.6	1.3	0.2	1.0	0.2	0.9	1.9	0.1	0.7
Trichiurus lepturus	0.4	0.6	0.1	0.4	2.9		0.3	0.4	0.1
Prionotus rubio	0.2	0.7	0.1	0.1	0.1	0.1	0.2	0.1	0.3
Leiostomus xanthurus	0.2	0.1	0.7	1.5	0.3			0.1	
Menticirrhus americanus	0.2			0.1		0.1		0.1	
Prionotus tribulus	0.1								
Astroscopus y-graecum	0.1	0.2							
Brevoortia patronus	0.1								
Unknown larval fish		0.9							
Peprilus burti		0.5	0.1						
Arius felis				0.1					
Citharichthys spilopterus					0.2	0.1			
Ancylopsetta quadrocellata					0.1				
Achirus lineatus					0.1			0.1	
Umbrina coroides									0.1
NEKTONIC INVERTEBRATES									
Callinectes similis	15.7	19.7	14.3	3.1	18.2	29.9	4.4	9.2	27.8
Xiphopeneus krøyeri	12.9	0.9	2.6	1.5	1.3	0.1	0.6	1.3	
Penaeus setiferus	4.3	4.8	3.6	3.2	24.7	25.6	15.6	6.1	16.5
Callinectes sapidus	0.9	0.1	0.1	0.1	1.0			0.2	0.2
Penaeus aztecus	0.7	1.5	1.0	1.5	1.5	3.1	1.8	1.5	4.2
Acetes americanus		0.5		0.1	0.3	2.2	0.2		3.1
Loliguncula brevis		0.1	0.3	0.1	0.2	0.3	1.3		0.2
Sicyonia dorsalis						0.3			
BENTHIC MACROINVERTEBRATES									
Pagurus longicarpus	0.2	0.1	0.1		1.1				0.1
Bunodactis texensis	0.2				0.1				
Hepatus epheliticus	0.1	0.1		0.2					
Squilla empusa	0.1	0.1	0.2		1.9	4.7	0.7	0.6	4.2
Mole crab	0.1								
Actinaria, unID	0.1								
Ovalipes guadulpensis		0.2							
Persephona aquilonaris		0.1				0.1			
Lunarca ovalis			0.3		0.5				
Busycon contrarium			0.1	0.1	0.1	0.1		0.1	0.1
Thais haemastoma			0.1		0.1				
Polinices duplicatus			0.1						
Calliactis tricolor			0.1						
Porcellana sayana				0.1					
Panopeus herbsti					0.1				
Gastropoda, unID						1.1			

(continued)

Table 7 (Concluded)

Summary	1	2	3	4	5	6	7	8	9
	Stations								
Vertebrates									
species	14	13	11	12	12	9	9	11	10
individuals	792	754	1435	1469	452	241	477	913	417
Nektonic Invertebrates									
species	5	7	6	7	7	7	6	5	6
individuals	422	290	407	158	438	456	152	207	498
Benthic Macroinvertebrates									
species	6	5	7	3	7	5	1	2	3
individuals	9	6	14	5	37	45	5	8	42
TOTAL									
species	25	25	24	22	26	21	16	18	19
individuals	1223	1050	1856	1632	927	742	634	1128	957

Table 8

Summary of the Zooplankton Data Collected During the Pilot Study on 14 May 1976

	Inshore Collection			Offshore Collection				
Meroplankton	A_1	A_2	$\bar{X}_A$	B_1	B_2	$\bar{X}_B$	$\%\bar{X}_A$	$\%\bar{X}_B$
Cnidaria	8.7	36.6	22.7	25.4	32.0	28.7	0.52	0.49
Polychaeta	0.4	0.7	0.6	1.6	4.8	3.2	0.01	0.05
Mollusca	4.9	81.2	43.1	79.0	31.2	55.1	0.99	0.94
Cirripedia	12.5	1.4	7.0	7.2	12.4	9.8	0.16	0.17
Other Crustacea	82.4	132.1	107.3	79.6	68.4	74.0	2.48	1.27
Miscellaneous	1.9	15.4	8.7	5.2	6.2	5.7	0.20	0.10
Total Meroplankton	110.8	267.4	189.4	198.0	155.0	176.5	4.37	3.02
Holoplankton								
Protozoa	0.1	0.6	0.4				0.01	
Radiata	3.9	26.8	15.4	14.4	30.8	22.6	0.36	0.39
Polychaeta	0.3	2.3	1.3	0.6	1.4	1.0	0.03	0.02
Mollusca					0.4	0.2		P
Copepoda	3805.9	3291.2	3548.6	6159.3	4400.0	5279.7	81.88	90.27
Other Crustacea	18.4	38.3	28.4	23.6	23.0	23.3	0.66	0.40
Chaetognatha	469.9	507.3	488.6	319.8	322.4	321.1	11.27	5.49
Urochordata	46.8	77.0	61.9	34.2	14.6	24.4	1.43	0.42
Total Holoplankton	4345.2	3942.9	4144.6	6551.9	4792.6	5672.3	95.63	96.98
Total Zooplankton	4456.0	4210.3	4334.0	6749.9	4947.6	5848.8		

* Data are numbers of individuals of each major taxon per m^3 of water filtered. A--collection from inshore half of DMDS; B--collection from offshore half of DMDS; P--$<$ 0.01%.

Table 9

The Coordinates of Each of the 25 Stations Sampled During the Experimental Study

Station	Latitude	Longitude	
2-1	29°17'41"	94°40'01"	(Buoy B)
2-2	29°17'49"	94°39'51"	
2-3	29°17'33"	94°39'51"	
2-4	29°17'33"	94°40'08"	
2-5	29°17'24"	94°39'41"	
12-1	49°16'13"	94°38'38"	
12-2	29°16'15"	94°38'19"	
12-3	29°16'06"	94°38'29"	(Buoy C)
12-4	29°15'58"	94°38'37"	
12-5	29°15'58"	94°38'18"	
14-1	29°15'15"	94°37'47"	
14-2	29°15'17"	94°37'30"	
14-3	29°15'06"	94°37'37"	(Buoy D)
14-4	29°15'01"	94°37'48"	
14-5	29°14'58"	94°37'27"	
15-1	29°17'23"	94°40'50"	
15-2	29°17'23"	94°40'29"	
15-3	29°17'15"	94°40'40"	
15-4	29°17'06"	94°40'49"	
15-5	29°17'06"	94°40'30"	
27-1	29°15'34"	94°39'27"	
27-2	29°15'32"	94°39'17"	
27-3	29°15'24"	94°39'25"	
27-4	29°15'16"	94°39'34"	
27-5	29°15'14"	94°39'14"	

Table 10

The Estimated Volume (m^3) of Sediment Dredged Each Day by the McFARLAND Between 24 August and 24 September 1975 and the Buoy Where Disposal Occurred

	Date	No. Loads	Est. m^3	Disposal Site
August	24	6	7,845	B
	25	12	16,116	B
	26	13	17,854	B
	27	9	12,414	D
	28	16	21,275	D
	29	14	17,319	D
	30	13	14,667	D
	31	14	16,094	D
September	1	14	16,741	D
	2	13	15,634	D
	3	12	15,549	D
	4	14	18,217	D
	5	13	16,642	D
	6	13	17,719	D
	7	13	18,026	D
	8	11	14,722	D
	9	12	16,435	D
	10	8	10,531	B/C
	11	11	15,562	B/C
	12	12	17,655	B/C
	13	12	15,834	B/C
	14	12	16,719	B/C
	15	12	16,648	B
	16	11	15,697	B
	17	11	15,507	B
	18	9	13,083	B
	19	11	15,507	B
	20	11	15,499	B

(Continued)

Table 10 (Concluded)

	Date	No. Loads	Est. m^3	Disposal Site
September	21	10	14,319	B
	22	11	15,603	B
	23	13	19,625	B
	24	4	6,161	B

Table 11

The Field Description of the Sediments Collected at Block 2 Stations July 1975-May 1976 Compared with the Amount of Shell Hash (cm^3) per cm of Core Box Penetration, the Percent Carbonate in the Sediments and the Mean Grain Size

Date and Station	Sediment Description	Shell Hash	Percent Carbonate	$\bar{X}$ Ø
July				
2-1	Sand with shell hash	214		
2-2	Sandy shell over clay			
2-3	Gray clay	5		
2-4	Silt over sand over soft gray clay			
2-5	Brown silt over sand over gray clay	16		
September				
2-1	Muddy sand with much shell hash	47		
2-2	Hard sand with little mud	25		
2-3	Sand, little mud and shell	26		
2-4	Muddy sand and gray clay			
2-5	Hard sandy mud and Beaumont clay	44		
November				
2-1	Sand and shell hash	25		
2-2	Gray clay with sand and shell	32		
2-3	Black muddy sand	23		
2-4	Muddy sand and gray clay	10		
2-5	Muddy sand with shell	16		

(Continued)

Table 11 (Concluded)

Date and Station	Sediment Description	Shell Hash	Percent Carbonate	$\bar{X}$ Ø
January				
2-1	Sand and shell hash, some Beaumont Clay	387	33.5	2.17
2-2	Sand over sandy mud	26	5.0	2.45
2-3	Oxidized mud over sandy mud	11	2.4	7.31
2-4	Oxidized mud over muddy sand	22	4.3	7.51
2-5	Oxidized sandy mud over gray clay; much Beaumont Clay	54	5.3	7.73
March				
2-1	Sandy mud and shell hash; much Beaumont Clay	45	27.5	5.12
2-2	Sand and shell hash	57	26.8	5.00
2-3	Oxidized silt over gray clay	16	3.2	8.80
2-4	Oxidized silt over gray clay	16	1.9	7.64
2-5	Oxidized silt over sandy gray clay; much shell hash	59	2.7	6.39
May				
2-1	Oxidized silt over sand, some Beaumont Clay		1.8	4.20
2-2	Oxidized silt over 10 cm muddy sand over hard sand	21	1.9	7.32
2-3	Hard sand	25	6.1	4.21
2-4	Oxidized mud over sandy mud and gray clay	23	2.5	6.73
2-5	Fine sand over sandy mud	44	2.0	2.94

Table 12

The Field Description of the Sediments Collected at Block 15 Stations, July 1975-May 1976 Compared with the Amount of Shell Hash (cm^3) per cm of Core Box Penetration, the Percent Carbonate in the Sediments and the Mean Grain Size

Date and Station	Sediment Description	Shell Hash	Percent Carbonate	$\bar{X}$ Ø
July				
15-1	Not recorded	12		
15-2	Sand and shell over gray clay	6		
15-3	Sand and shell	5		
15-4	Shell and sand over gray clay	3		
15-5	Sand and shell	26		
September				
15-1	Hard sand with little mud	2		
15-2	Hard muddy sand bottom	9		
15-3	Muddy sand with some shell and some gray clay	13		
15-4	Black mud and gray clay	3		
15-5	Hard sand with some mud	5		
November				
15-1	Oxidized sand over gray clay	2		
15-2	Black organic mud	16		
15-3	Hard sand	24		
15-4	Sandy mud	7		
15-5	Sandy gray clay	8		

(Continued)

Table 12 (Concluded)

Date and Station	Sediment Description	Shell Hash	Percent Carbonate	$\bar{X}$ Ø
January				
15-1	Hard muddy sand	13	6.5	4.90
15-2	Sand over mixture of sand, clay, and soft mud	13	2.8	5.30
15-3	Hard sand; A and D nearly pure sand; B, C, and E soft black mud	6	1.5	5.95
15-4	Sandy silt	5	1.3	6.95
15-5	Sand over gray clay	6	1.2	4.65
March				
15-1	Oxidized mud over muddy sand		2.2	3.32
15-2	Oxidized mud over loose muddy sand	24	6.0	4.87
15-3	Oxidized mud over loose muddy sand		22.7	4.47
15-4	Mud over muddy gray clay, little sand	7	2.0	5.02
15-5	Mud over sandy gray clay	8	2.4	6.21
May				
15-1	Hard sand with some mud	18	2.1	5.69
15-2	Hard sand over muddy sand	13	3.1	3.88
15-3	Oxidized mud over sandy gray clay	14	1.2	4.49
15-4	Oxidized silt over sandy gray clay	10	1.3	5.14
15-5	Sand over sandy gray clay	18	2.9	4.15

Table 13

The Field Description of the Sediments Collected at Block 12 Stations, July 1975 -May 1976 Compared with the Amount of Shell Hash (cm^3) per cm of Core Box Penetration, the Percent Carbonate in the Sediments, and the Mean Grain Size

Date and Station	Sediment Description	Shell Hash	Percent Carbonate	$\bar{X}$ Ø
July				
12-1	Dredged material with clay, shell and sand	92		
12-2	Soft black mud with gray clay and sand			
12-3	Clay with sand and shell			
12-4	Clay with sand and shell			
12-5	Soft gray clay			
September				
12-1	Gray sandy clay with little shell; no evidence of disposal	97		
12-2	Gray sandy clay with some shell; no evidence of disposal	17		
12-3	Shell and sand: thick clumps of gray clay; disposal evident	617		
12-4	Gray clay with little shell; no evidence of disposal	14		
12-5	Muddy sand to sandy mud; disposal evident	85		
November				
12-1	Oxidized silt over thick gray clay	4		
12-2	Gray clay with sand	25		
12-3	Dredged material; shell and Beaumont Clay	267		
12-4	Soft gray clay	7		
12-5	5 cm sand and shell over gray clay	80		

(Continued)

Table 13 (Concluded)

Date and Station	Sediment Description	Shell Hash	Percent Carbonate	$\bar{X}$ Ø
January				
12-1	Muddy gray clay, some sand, Beaumont Clay, and much shell hash	12	18.6	7.38
12-2	Hard gray clay; some shell hash, Beaumont Clay	37	37.7	5.42
12-3	Sand and shell hash (Van Veen samples)	504	20.8	1.54
12-4	Sandy clay mixed with shell hash	26	4.0	5.59
12-5	Oxidized mud over sandy mud and shell hash over sandy clay	20	3.1	7.92
March				
12-1	Oxidized silt over gray clay		1.8	8.32
12-2	Sandy mud over gray clay, some shell hash		3.3	5.36
12-3	Hard sand and shell hash with some gray clay	260	37.8	2.82
12-4	Oxidized mud over gray clay, some large shell	13	1.8	9.05
12-5	Oxidized sandy mud over sandy clay, little shell hash	17	9.0	6.55
May				
12-1	Oxidized mud over sandy mud and gray clay	19	5.5	5.54
12-2	Oxidized mud over sandy gray clay; very compact	27	1.9	6.14
12-3	6 cm shell hash over sand	414	66.9	0.28
12-4	Large quantities of shell hash with some sand	360	99.9	1.80
12-5	Oxidized mud over sandy mud and gray clay, some Beaumont Clay	26	2.1	7.78

Table 14

The Field Description of the Sediments Collected at Block 14 Stations, July 1975-May 1976 Compared with the Amount of Shell Hash (cm^3) per cm of Core Box Penetration, the Percent Carbonate in the Sediments and the Mean Grain Size

Date and Station	Sediment Description	Shell Hash	Percent Carbonate	$\bar{X}$ Ø
July				
14-1	Gray sandy mud	11		
14-2	Gray mud	16		
14-3	Clay with sand and shell	11		
14-4	Soft mud; shell layer at 40 cm	9		
14-5	Thick gray clay, little sand	10		
September				
14-1	Gray clay and mud with some shell	4		
14-2	Sandy clay with shell	4		
14-3	Sandy gray clay with shell hash	19		
14-4	Gray clay and sand			
14-5	Some sandy shell, gray clay	3		
November				
14-1	Oxidized mud over gray clay	15		
14-2	Oxidized mud over sandy gray clay	5		
14-3	Muddy sand with large shells, much Beaumont Clay	77		
14-4	Oxidized mud over muddy sand and clay, few large shells	12		
14-5	Oxidized mud over sandy gray clay	4		

(Continued)

Table 14 (Concluded)

Date and Station	Sediment Description	Shell Hash	Percent Carbonate	$\bar{X}$ Ø
January				
14-1	Sand-shell hash and Beaumont Clay	126	28.0	3.82
14-2	Oxidized mud over gray clay with shell hash and Beaumont Clay	8	2.2	6.59
14-3	Sand and shell hash; some Beaumont Clay	159	63.9	5.37
14-4	Oxidized mud over muddy gray clay	9	24.4	6.20
14-5	Oxidized silt over gray clay	7	1.8	7.17
March				
14-1	Oxidized mud over gray clay, little shell hash	13	1.5	5.92
14-2	Brown oxidized silt over thick clay	7	2.0	5.82
14-3	Sand and shell hash over gray clay and traces of Beaumont Clay	37	50.4	4.67
14-4	Sand and shell hash over gray clay; traces of Beaumont Clay	14	1.6	8.23
14-5	Sandy clay layer with lots of shell hash over gray clay	44	3.6	6.32
May				
14-1	Shell hash over gray clay; Beaumont Clay in sample	60	26.8	5.71
14-2	Oxidized mud over clay and large shell over gray clay	10	2.0	8.30
14-3	Fine muddy sand and shell hash over sandy mud with some Beaumont Clay	48	31.0	4.98
14-4	Oxidized silt over gray clay	14	3.0	
14-5	Oxidized sandy mud over sandy clay over gray clay	13	2.8	

Table 15

The Field Descriptions of the Sediments Collected at Block 27 Stations, July 1975-May 1976 Compared with the Amount of Shell Hash (cm^3) per cm of Core Box Penetration, the Percent Carbonate in the Sediments, and the Mean Grain Size

Date and Station	Sediment Description	Shell Hash	Percent Carbonate	$\bar{X}$ Ø
July				
27-1	Oxidized silt over soft gray clay			
27-2	Oxidized silt over soft gray clay			
27-3	Oxidized silt over soft gray clay	7		
27-4	Oxidized silt over soft gray clay			
27-5	Oxidized silt over soft gray clay			
September				
27-1	Very loose muddy sand	2		
27-2	Very loose muddy sand			
27-3	Not recorded	1		
27-4	Very soft muddy sand	2		
27-5	Oxidized mud over sand, mud and gray clay	3		
November				
27-1	Soft gray clay	6		
27-2	Gray clay; shells near bottom of core	14		
27-3	Oxidized silt over gray clay	11		
27-4	Thick gray clay	4		
27-5	Oxidized silt over gray clay	13		

(Continued)

Table 15 (Concluded)

Date and Station	Sediment Description	Shell Hash	Percent Carbonate	$\bar{X}$ Ø
January				
27-1	Oxidized silt over gray clay	2	1.2	8.76
27-2	Oxidized dilt over gray clay	10	1.2	9.17
27-3	Oxidized silt over gray clay	8	1.1	7.40
27-4	Oxidized silt over gray clay	4	1.2	8.92
27-5	Oxidized silt over gray clay		4.3	
March				
27-1	Oxidized mud over muddy gray clay	3	1.3	9.97
27-2	Oxidized mud over gray clay	9	1.8	9.29
27-3	Oxidized mud over gray clay	6	1.3	8.65
27-4	Oxidized silt over gray clay	7	1.0	9.14
27-5	Oxidized mud over muddy gray clay	12	1.5	8.26
May				
27-1	Oxidized mud over gray clay	6	1.1	9.12
27-2	Oxidized mud over gray clay	10	1.0	8.31
27-3	Oxidized mud over soft mud	11	2.2	9.61
27-4	Oxidized mud over sandy gray clay	6		9.61
27-5	Oxidized mud over gray clay	9	1.0	9.08

Table 16

F Values and Significance (5% level) of the Variance Between Benthic Populations in Each Pair of Blocks in the Dredged Material Disposal Site

		Block				
		2	15	12	14	27
	2	X	5.219	1.371	2.452	3.218
	15	S	X	1.417	3.187	4.591
Block	12	NS	NS	X	1.600	0.995
	14	S	S	NS	X	2.821
	27	S	S	NS	S	X

Table 17

F Values and Significance (5% Level) of the Variance Between Populations and Diversities at Stations Within Each Block in the Dredged Material Disposal Site

	Blocks				
F (populations)	1.27	0.47	0.69	1.17	0.10
Significance	NS	NS	NS	NS	NS
F (diversity)	1.37	0.31	0.49	0.44	0.96
Significance	NS	NS	NS	NS	NS

Table 18

Two-Way Table, July-May Benthic Data

SITES

Site columns (in order within each group): Group 1: 2-4, 2-3, 2-5, 2-2, 15-5, 15-4, 15-3, 15-1, 15-2, 2-1; Group 2: 14-3, 14-1, 14-2, 14-5, 14-4, 12-2, 12-4, 12-1, 12-5; Group 3: 12-3; Group 4: 27-5, 27-2, 27-1, 27-3, 27-4.

	SPECIES	1	2	3	4
1	DIOPATRA CUPREA	**+*****+-*	+-+******	-	+****
	CEREBRATULUS LACTEUS	+****+-+--	*******+*	-	+**+*
	LUMBRINERIS TENUIS	+****+-+.-	******+-*	+	++*++
	NEREIS SP	***-****++-	+-+-+-+**	*	+-+--
	PRIONOSPIO PINNATA	*******+*-*	.-------.	-	.....
	MEDIOMASTUS CALIFORNIENSIS	**********	--..-....	-	.....
	MAGELONA SP	********+*	+++**+*++	-	+++++
	AMPELISCA ABDITA	.-----.-.-	****-***-	+	--.--
	PINNIXA CRISTATA	-+--*-.---	***+--+-+	-	--+--
	BALANOGLOSSUS	.--- .-.- .	*.-+-+-.*	.	-...-
	SIGAMBRA TENTACULATA	****+-**-*	-++-+--++	+	+****
	SIGAMBRA WASSI	-+-.--++ +	+-+.*--+*	-	**++-
	NUCULANA CONCENTRICA	+-------.-	*********	-	*****
	NINOE NIGRIPES	-- .+- .	+******+-	.	++--+
	ANCISTROSYLLIS JONESI	-***+--- +	-.+--+++	-	--+-*+
	COSSURA DELTA	**-*-*.-.	-+--+.---		----+
	CLYMENELLA ZONALIS	**---+-* +	-++++--+*		--.+-
	LEPIDASTHENIA SP	.-. --..	*+-.+-.--	-	--.-.
	VITRINELLA HELICOIDEA	- .+ +.	.-.-.-.+-		*-*++
2	NEMERTEA (YELLOW BANDED)	**********	+++-+-+++	*	..-.-
	GLYCINDE SOLITARIA	*******+-+	-------+	-	++--.
	GLYCERA AMERICANA	***-****-+	+++-+-+**	*	-- .+
	ABRA AEQUALIS	--++--+*+-	++.+--.-+	*	--.--
	NEREIS SUCCINEA	---+-+-+*+	*+-.-.+--	*	....
	PHORONIS ARCHITECTA	----+-+*--	***.--.--	+	.
	HEMIPHOLIS ELONGATA	-+.-***+--	+ -.*+-..	-	-+---
	COROPHIUM ACHERUSICUM	--+-****+	+ -----.-	+	-.-
	PSEUDEURYTHOE AMBIGUA	--+-+*--.-	. ---	.	..
	PRIONOSPIO CIRRIFERA	.++ +*-.-.	.-. .-+*-	*	--
	PAGURUS ANNULIPES	......---.	-+-....-	*	....
	SPIOPHANES BOMBYX	.......--.	... .	*	.
	NEMATODA	... ...	... .	*	.
	POLYGORDIUS SP.		. +	*	
3	NASSARIUS ACUTUS	--+-+***--	--. .---.	-	.- .-
	SPIOCHAETOPTERUS OCULATUS	++---+***+	--. ---+-	-	-- .-
	OWENIA FUSIFORMIS	--*-******	.+---+--	+	- .-
	NATICA PUSILLA	++ **-+**+	-+. . + +	.	.+-..
	CIRRATULUS HEDGPETHI	- -...*..	--- -.	.	-.. .
	NEMERTEA (YELLOW & PURPLE)	****-***-+	. - -	.	-
	MULINIA LATERALIS	*.---+-+-+	-		
	OXYUROSTYLIS SALINOI	*-***+-+*+	+- - - -	.	- --
	PARANTHUS RAPIFORMIS	- - -+**.+			
	OGYRIDES LIMICOLA	+ + -**--	- -	+	
	BUNODACTIS TEXENSIS	+*---+++	. ----- .		
	BATEA CARTHARINENSIS	-+- +- -**	+--- --		-
	PSEUDOPOLYDORA SP	.-- *.-+*+	- -	.	--
	MELINNA MACULATA	+- ++ **		-	
	MAGELONA RIOJAI	.. ... **	. -		. .
	SCOLELEPSIS SQUAMATA	- - - **	-		-
	PRIONOSPIO CAYI	-. -- *+	.	-	
4	STHENELAIS BOA	*+.-.- --	-++*+**++	-	-. ++
	MAGELONA ROSEA	-*+- - +-	*.*-*--+-	+	-+ +-
	NEMERTEA (WHITE)	*** - - --	+**--+--	*	- --
	THARYX SETIGERA	* -- ---+*	---+-- *	*	--
	NOTOMASTUS LATERICEUS	******-+-+	+** *****	+	-
	TELLINA VERSICOLOR	---- +--	****++--*	*	-
	AGLAOPHAMUS VERRILLI	--+- --+--	*** - - -	*	--
	MICROPHOLIS ATRA	-.+* + -	+++-+*--+		-
	ARICIDEA SP	- *-+* -	********	*	*-*--
	GYPTIS VITTATA	--+------.	-.-.--**	*	--* -
	ANADARA TRANSVERSA	--+-.----*.	- -.- ++	*	.
	AMPHARETE (EYES)	***+.--- -	+--++---	*	- . -
	BRANCHIOSTOMA CARIBAEUM	.++-	.. -	+	
	ANAITIDES ERYTHROPHYLLUS	. . . --.-	--. .-	*	
	NEPHTYS BUCERA	. - **	*.-.-.--	*	..
	ELECTRA SP (COLONIES)	- + ** *	** + + +	*	-+
	MONOCULODES SP	+ * *	*+ +		+
5	ASYCHIS ELONGATA	-	-**+-+*		+*-+*
	ARMANDIA AGILIS	+--. -.	+****-***	-	+--+*
	VOLVULELLA TEXASIANA	-	**** +*--	-	-+*+*
	PHOTIS SP.	-	--** *- -	-	+ - +
	POLYDORA SOCIALIS	.--	- ----	*	--
	AMPHIPODA, UN ID	++ :	*- * -	*	-*
	LISTRIELLA SP	- --- -	*+-*- +		.+ -+
	CORBULA BARRATTIANA	+	+ +++ +		+ +
	BASCANICHTHYS TERES	+	* *		** +
	SPIOCARCINUS LOBATUS	*** ** +	* -*- -		+ +
	ELASMOPUS RAPAX	** + - +	**+-		- -
	CALLIANASSA ACANTHOCHIRUS	+	-+ *+ **	-	+
	CERATOCEPHALE SP.	-	*- *+ +		+
	CALLIANASSA LATISPINA	+* - -	** +-		+*+
6	CLYMENELLA TORQUATA CALIDA	+ +	-+*- +--.	-	
	CLYTIA CORONATA (COLONIES)	+ + ++	*** *	+	
	AMPHARETE ACUTIFRONS		-*+ -- +	+	.-
	PALEONOTUS HETEROSETA		**- *+ *	+	+ -
	GIANT SPERM	- -	.-***.+	-	-
	LEPIDONOTUS SUBLEVIS	+--	--+** +*-	-	
	ANACHIS OBESA	****--* .	------ -	-	--
	TEPERRA PROTEXTA	--.--* -	-- ---+	-	+-
	PHASCOLION STROMBI	+*- + + -	+-* *-+*-	-	+ +
	TELLINA IRIS	*--	+--* -*		+-- -
	NEPHTYS INCISA	- +* -	+-****		*-+
	LUNARCA OVALIS	+ + +	. +++	+	
	NEOPANOPE TEXANA	- - +	*-- - -		
	MESOCHAETOPTERUS TAYLORI	. .. -	*+		
	EUCERAMUS PRAELONGUS	- - -	--* -+	*	-
	AMPITHOE SP	+ +	+ --*-	+	-

MAGELONA SP
AMPELISCA ABDITA
PINNIXA CRISTATA
BALANOGLOSSUS
SIGAMBRA TENTACULATA
SIGAMBRA WASSI
NUCULANA CONCENTRICA
NINOE NIGRIPES
ANCISTROSYLLIS JONESI
COSSURA DELTA
CLYMENELLA ZONALIS
LEPIDASTHENIA SP
VITRINELLA HELICOIDEA

1

NEMERTEA (YELLOW BANDED)
GLYCINDE SOLITARIA
GLYCERA AMERICANA
ABRA AEQUALIS
NEREIS SUCCINEA
PHORONIS ARCHITECTA
HEMIPHOLIS ELONGATA
COROPHIUM ACHERUSICUM
PSEUDEURYTHOE AMBIGUA
PRIONOSPIO CIRRIFERA
PAGURUS ANNULIPES
SPIOPHANES BOMBYX
NEMATODA
POLYGORDIUS SP.

2

NASSARIUS ACUTUS
SPIOCHAETOPTERUS OCULATUS
OWENIA FUSIFORMIS
NATICA PUSILLA
CIRRATULUS HEDGPETHI
NEMERTEA (YELLOW & PURPLE)
MULINIA LATERALIS
OXYUROSTYLIS SALINOI
PARANTHUS RAPIFORMIS
OGYRIDES LIMICOLA
BUNODACTIS TEXENSIS
BATEA CARTHARINENSIS
PSEUDOPOLYDORA SP
MELINNA MACULATA
MAGELONA RICJAJ
SCOLELEPSIS SQUAMATA
PRIONOSPIO CAYI

3

STHENELAIS BOA
MAGELONA ROSEA
NEMERTEA (WHITE)
THARYX SETIGERA
NOTOMASTUS LATERICEUS
TELLINA VERSICOLOR
AGLAOPHAMUS VERRILLI
MICROPHOLIS ATRA
ARICIDEA SP
GYPTIS VITTATA
ANADARA TRANSVERSA
AMPHARETE (EYES)
BRANCHIOSTOMA CARIBAEUM
ANAITIDES ERYTHROPHYLLUS
NEPHTYS BUCERA
ELECTRA SP (COLONIES)
MONCULODES SP

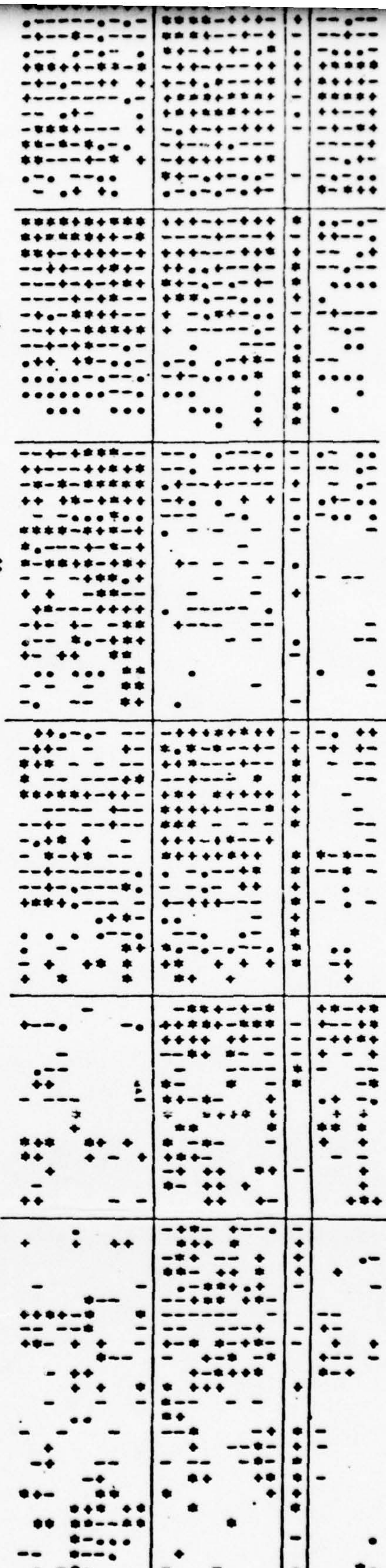
4

ASYCHIS ELONGATA
ARMANDIA AGILIS
VOLVULELLA TEXASIANA
PHOTIS SP.
POLYDORA SOCIALIS
AMPHIPODA, UN ID
LISTRIELLA SP
CORBULA BARRATTIANA
BASCANICHTHYS TERES
SPIOCARCINUS LOBATUS
ELASMOPUS RAPAX
CALLIANASSA ACANTHOCHIRUS
CERATOCEPHALE SP.
CALLIANASSA LATISPINA

5

CLYMENELLA TORQUATA CALIDA
CLYTIA CORONATA (COLONIES)
AMPHARETE ACUTIFRONS
PALEONOTUS HETEROSETA
GIANT SPERM
LEPIDONOTUS SUBLEVIS
ANACHIS OBESA
TEREBRA PROTEXTA
PHASCOLION STROMBI
TELLINA IRIS
NEPHTYS INCISA
LUNARCA OVALIS
NEOPANOPE TEXANA
MESOCHAETOPTERUS TAYLORI
EUCERAMUS PRAELONGUS
AMPITHOE SP
STYLOCHUS ELLIPTICUS
PISTA CRISTATA
NOTOMASTUS HEMIPODUS
EDWARDSIA SP
MALACOCEROS SP
THALASSEMA HARTMANI
PINNIXA LUNZI
PARAMYA SUBOVATA

6



Symbols indicate intervals on a standardized scale of 0 to 1

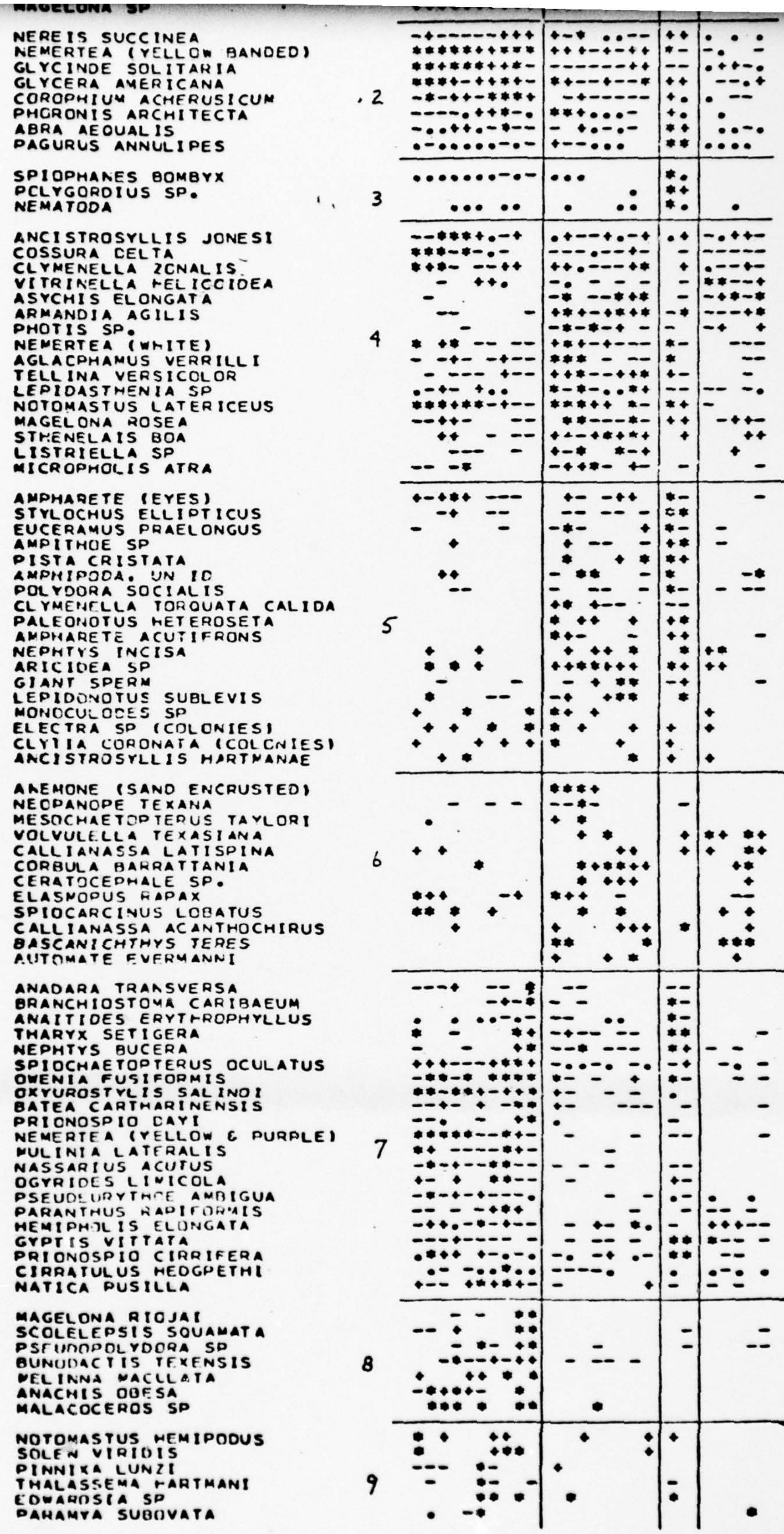
- ≤ 0
- 0-0.25
- 0.25-0.50
- 0.50-0.75
- ≥ 0.75

2

Table 15

Two-Way Table, November-May Benthic Data

SPECIES	SITES 1 (15-5, 2-2, 15-4, 15-3, 2-1, 2-3, 2-4, 2-5, 15-1, 15-2)	SITES 2 (14-5, 14-4, 14-2, 12-5, 14-3, 14-1, 12-1, 12-2)	SITES 3 (12-4, 12-3)	SITES 4 (27-2, 27-3, 27-1, 27-5, 27-4)
1				
LUMBRINERIS TENUIS	++++++-+-•	********	+-	+++++
CEREBRATULUS LACTEUS	+++*++-+--	++*+++*+	+*	*+++-
DIOPATRA CUPREA	+*++++*++-	-++*++*-	-+	*+***
NEREIS SP	**+*-*++++	-++-+-+*	**	+++--
PINNIXA CRISTATA	--+--*•-•-	***-++-+	•-	+----
AMPELISCA ABDITA	•-----•-••	**+++*--	+-	•----
NINOE NIGRIPES	--- •+	+++*+**-	+	-++-+
SIGAMBRA TENTACULATA	+-*+++***-	-------+	-+	+-*+*
SIGAMBRA WASSI	•-+- -+++	-+-+-•**	-+	+*++-
NUCULANA CONCENTRICA	+--------•	+*+++*++	•*	****+
BALANOGLOSSUS	•--- ••-•	+--+-+-*	••	•-••-
PRIONOSPIO PINNATA	*+++*+*++*-	--•----•	--	•••••
MEDIOMASTUS CALIFORNIENSIS	*+***+++*+	-•••••-•	-•	• ••
MAGELONA SP	++**+++*++	+++-++*+	-+	+-+-+
2				
NEREIS SUCCINEA	-+-----+++	+-* ••--	++	• • •
NEMERTEA (YELLOW BANDED)	*****++***	+++-+-++	*-	-• -
GLYCINDE SOLITARIA	**+***++*-	------++	--	•++-•
GLYCERA AMERICANA	***+-++*+-	*+--+--*	++	--•+
COROPHIUM ACHERUSICUM	-*-++-***+	-+-----	+•	• --
PHORONIS ARCHITECTA	----•++*-•	**+•••-	+•	•
ABRA AEQUALIS	-••++•-*--	- +•-•-	*+	••-•
PAGURUS ANNULIPES	•-•••••-•-	+--•••	**	••••
3				
SPIOPHANES BOMBYX	•••••••-•-	•••	*•	
POLYGORDIUS SP.		•	*+	
NEMATODA	••• ••	• ••	*•	•
4				
ANCISTROSYLLIS JONESI	--***+•-+	•+--+•-+	•+	-•++-
COSSURA DELTA	***-*-•-	---•--+-	-	-----
CLYMENELLA ZONALIS	*+*- --++	++•---+*	+	•--+-
VITRINELLA HELICOIDEA	- ++•	-• - - -	-	**--+
ASYCHIS ELONGATA	-	-* --*+*	-	-+*-*
ARMANDIA AGILIS	-- -	+*+-+*++	-*	---+*
PHOTIS SP.	-	-*-*-+ -	-	-+ +
NEMERTEA (WHITE)	* ++ -- --	+*+-+---	*-	---
AGLAOPHAMUS VERRILLI	- -+- -+--	*** - --	*	--
TELLINA VERSICOLOR	- --- +--	++*--++*	+-	-
LEPIDASTHENIA SP	•-+- +••	*-*-••*+	--	-- -•
NOTOMASTUS LATERICEUS	***+**-+--	***++ *-	*+	-
MAGELONA ROSEA	--++- --	**---*-	++	-++-
STHENELAIS BOA	++ - --	++-+*+*+	+	++
LISTRIELLA SP	--- -	+-* *-+		+
MICROPHOLIS ATRA	-- -*	-++*- +-	-	-
5				
AMPHARETE (EYES)	+-+*+ ---	+- -++	*-	-
STYLOCHUS ELLIPTICUS	-+ --	-- -- -	**	
EUCERAMUS PRAELONGUS	- -	-*- +	*-	-
AMPITHOE SP	+	+ -- -	+*	-
PISTA CRISTATA		* + *	*+	
AMPHIPODA, UN ID	++	- ** -	*	-*
POLYDORA SOCIALIS	--	- -- -	*-	- --
CLYMENELLA TORQUATA CALIDA		+* +--	--	
PALEONOTUS HETEROSETA		* ++ +	+*	
AMPHARETE ACUTIFRONS		*+- -	++	-
NEPHTYS INCISA	+ +	+ ++ *	*	+*
ARICIDEA SP	* * +	+++*+*++	*+	++
GIANT SPERM	- -	- + **	-+	-
LEPIDONOTUS SUBLEVIS	* --	-+ +**	*	
MONOCULODES SP	+ * *	*+ +		+
ELECTRA SP (COLONIES)	+ + * *	* + +	+	+
CLYTIA CORONATA (COLONIES)	+ + + +	* +	+	
ANCISTROSYLLIS HARTMANAE	+ *	*	+	+
6				
ANEMONE (SAND ENCRUSTED)		***+		
NEOPANOPE TEXANA	- - -	--*-	-	
MESOCHAETOPTERUS TAYLORI	•	+ *		
VOLVULELLA TEXASIANA		+ *	+	** **
CALLIANASSA LATISPINA	+ +	++	+	+ **
CORBULA BARRATTANIA	*	*+**++		+*
CERATOCEPHALE SP.		* +++		+
ELASMOPUS RAPAX	*+* -+	*++ -		--
SPIOCARCINUS LOBATUS	** * +	* *		+ +
CALLIANASSA ACANTHOCHIRUS	+	+ +++	*	+
BASCANICHTHYS TERES		** *		***
AUTOMATE EVERMANNI		+ + *		+
7				
ANADARA TRANSVERSA	---+ -- *	--	--	
BRANCHIOSTOMA CARIBAEUM	-+-*	- -	*-	
ANAITIDES ERYTHROPHYLLUS	• • ••-•-	-- ••	*-	
THARYX SETIGERA	* - *+	-+-- --	**	-
NEPHTYS BUCERA	- - +*	--* ---	*+	- -
SPIOCHAETOPTERUS OCULATUS	+++---+**+	-••-• -•	-+	-• -
OWENIA FUSIFORMIS	-**-* ****	*- - +	*-	- -
OXYURÓSTYLIS SALINOI	**-**+-++*	+- - -	•	
BATEA CARTHARINENSIS	--+- + -**	+- ---	-	-
PRIONOSPIO DAYI	--• - +*	•	-	
NEMERTEA (YELLOW & PURPLE)	*****--*+-	- -	--	-
MULINIA LATERALIS	*+ -----*+-	-		
NASSARIUS ACUTUS	-*-+--**--	- - -	--	
OGYRIDES LIMICOLA	+- + **--	-	+-	
PSEUDEURYTHOE AMBIGUA	-*-+-+----•	- -	•-	• •
PARANTHUS RAPIFORMIS	-- - -+**	-	-	-- -
HEMIPHOLIS ELONGATA	-++•-*-+--	- +- *•	-	+++--
GYPTIS VITTATA	---+---- -	- -- -	**	*-- -
PRIONOSPIO CIRRIFERA	•*++ +-•-•	-• -+ •-	**	--
CIRRATULUS HEDGPETHI	•- -••*••	----•	•	•-• •
NATICA PUSILLA	+-- +*+*+-	- +	-	- -
8				
MAGELONA RIOJAI	- - **			
SCOLELEPSIS SQUAMATA	-- + **		-	-
PSEUDOPOLYDORA SP	- *- +*	-	-	--
[illegible]	-*--+-++	- -- -		



Symbols indicate intervals on a standardized scale of 0 to 1

- = ≤ 0
• = 0-0.25
– = 0.25-0.50
+ = 0.50-0.75
* = ≥ 0.75

2

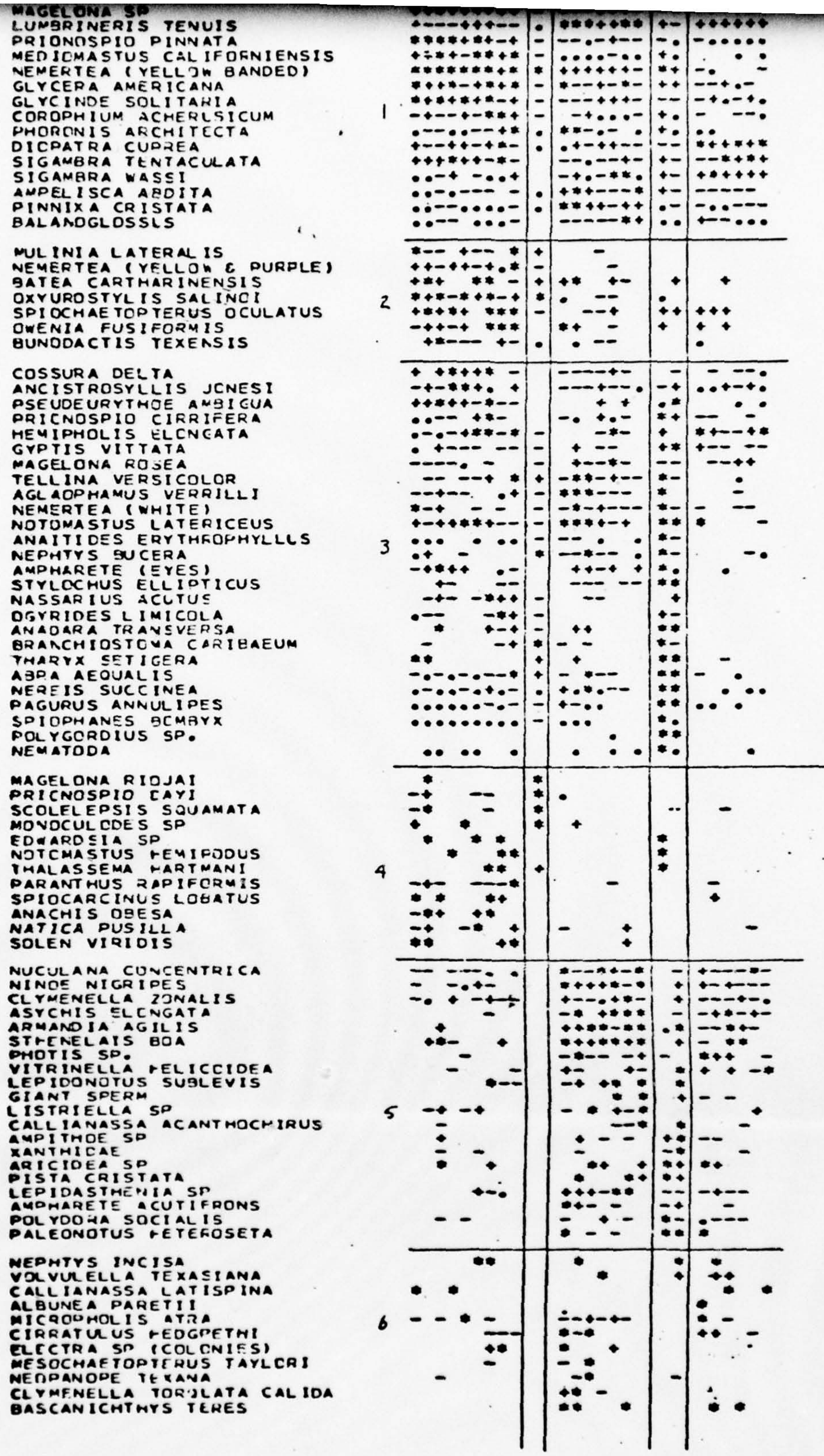
1

Table 20

Two-Way Table, January-May Benthic Data

SITES

	SPECIES	1 (15-2, 2-4, 15-4, 15-1, 2-3, 2-2, 2-5, 15-5, 15-3)	2 (2-1)	3 (14-5, 12-1, 12-5, 14-3, 14-1, 12-2, 14-2)	4 (12-3, 12-4)	5 (14-4, 27-4, 27-5, 27-2, 27-3, 27-1)
1	NEREIS SP	*-*--+***	+	-+++++-	**	-+---+
	CEREBRATULUS LACTEUS	+--++++-+	-	+*++*++	++	-+++++
	MAGELONA SP	++*++++*+	-	---+*+-	--	-+--+-
	LUMBRINERIS TENUIS	+---+++--	.	***+***	+-	++++++
	PRIONOSPIO PINNATA	****+**-+	-	--.-+--	-.	-.....
	MEDIOMASTUS CALIFORNIENSIS	++*+-**+*	-	....-..	+.	. . .
	NEMERTEA (YELLOW BANDED)	*********	*	++++++-	*+	-. -
	GLYCERA AMERICANA	*++*-+*+*	-	*--+-*-	++	--+.-
	GLYCINDE SOLITARIA	*+++*+*-+	-	---+++-	--	-+.-+.
	COROPHIUM ACHERUSICUM	-+--+-**+	-	-+...-	+.	- --.
	PHORONIS ARCHITECTA	.--..--+*	.	**-.- .	+.	..
	DIOPATRA CUPREA	+--++-+*-	.	.+-++--	--	*++*+*
	SIGAMBRA TENTACULATA	+++*++-*-		--.--+-	+-	--*+*+
	SIGAMBRA WASSI	..-+ -..+		-+.-**.	+-	+*++++
	AMPELISCA ABDITA	..-.--- -	.	+*+---*	+-	-----
	PINNIXA CRISTATA	..--....-	.	**++-++	.-	-..---
	BALANOGLOSSUS	..-- ...-		-----*+	..	+--...
2	MULINIA LATERALIS	*-- +-- *	+	-		
	NEMERTEA (YELLOW & PURPLE)	++-++-+.*	-	-		
	BATEA CARTHARINENSIS	+*+ ** -	+	** +-	+	+
	OXYUROSTYLIS SALINOI	*+*-*+*-+	*	. --	.	
	SPIOCHAETOPTERUS OCULATUS	+***+ ***	-	--+	++	+++
	OWENIA FUSIFORMIS	-++-+ ***		*+ -	+	+ +
	BUNODACTIS TEXENSIS	+*--- +-	.	. --		.
3	COSSURA DELTA	+ ****+ -		----+-	-	- --.
	ANCISTROSYLLIS JONESI	-+-***. +		---+--.	-+	..+-+.
	PSEUDEURYTHOE AMBIGUA	+***+-*--		+ +	.*	. .
	PRIONOSPIO CIRRIFERA	..-- +*-		-. +.-	*+	-- -
	HEMIPHOLIS ELONGATA	.-.-+**-*	-	-*-	+	*+--+*
	GYPTIS VITTATA	. +--- --	-	+ --	+*	+-- --
	MAGELONA ROSEA	----. -	-	+--*-	--	--++
	TELLINA VERSICOLOR	-- --+ *	+	-**-+--	*-	.
	AGLAOPHAMUS VERRILLI	--+--. .+	-	***---	*	-
	NEMERTEA (WHITE)	*-+ - -	-	-*-+---	*-	- --
	NOTOMASTUS LATERICEUS	+-+***+--	-	****-+	**	* -
	ANAITIDES ERYTHROPHYLLUS	... . ..	-	-- . .	*-	
	NEPHTYS BUCERA	.+ -	*	--*-- .	*-	-.
	AMPHARETE (EYES)	-*+++ .-		++-+ +	*.	.
	STYLOCHUS ELLIPTICUS	+- --		--- --	**	
	NASSARIUS ACUTUS	-+- -*++	-	--	+	
	OGYRIDES LIMICOLA	.-- -*+	-		+-	
	ANADARA TRANSVERSA	* +-+	-	++	**	
	BRANCHIOSTOMA CARIBAEUM	- -+	*	- -	*-	
	THARYX SETIGERA	**	+	+	**	-
	ABRA AEQUALIS	-.-.-.--*	+	- *--	**	- .
	NEREIS SUCCINEA	.-..-.+.-	.	+.*.--	**	. ..
	PAGURUS ANNULIPES	......-.-	-	+-..	**	.. .
	SPIOPHANES BOMBYX	....	-	...	*.	
	POLYGORDIUS SP.			.	**	
	NEMATODA	.. .. .		. . .	*.	.
4	MAGELONA RIOJAI	*	*			
	PRIONOSPIO CAYI	-+ --	*	.		
	SCOLELEPSIS SQUAMATA	-* -	*		--	-
	MONOCULODES SP	+ *	*	+		
	EDWARDSIA SP	* * *			*	
	NOTOMASTUS HEMIPODUS	* **			*	
	THALASSEMA HARTMANI	**	+		*	
	PARANTHUS RAPIFORMIS	-+- ---*		-		-
	SPIOCARCINUS LOBATUS	* * *+				+
	ANACHIS OBESA	-*+ +*				
	NATICA PUSILLA	-+ -* +		- +		-
	SOLEN VIRIDIS	** +*		+		
5	NUCULANA CONCENTRICA	-- ---. .		*--*+-*	-	+---*-
	NINOE NIGRIPES	- -.+-		*++++-*	+	+-+---
	CLYMENELLA ZONALIS	-. + -+-+		+--.+*-	+	---+-.
	ASYCHIS ELONGATA	-		-* +***	-	-+*-+-
	ARMANDIA AGILIS	+		++**-**	.*	--*+-
	STHENELAIS BOA	+*- +		*+****+*	+	- **
	PHOTIS SP.	-		-*-- -+	-	*++ -
	VITRINELLA HELICOIDEA	- -		+- +-	*	+ + -*
	LEPIDONOTUS SUBLEVIS	*--		-+ +* *	*	
	GIANT SPERM			* *	+	- -
	LISTRIELLA SP	-+ -+		- * +-*		+
	CALLIANASSA ACANTHOCHIRUS	-		--*	*	-
	AMPITHOE SP	+		+ - -	+*	--
	XANTHIDAE	- -		-	-*	-
	ARICIDEA SP	* +		*+ +	**	**
	PISTA CRISTATA			* *+	*+	
	LEPIDASTHENIA SP	+-.		+++-**	--	-+--
	AMPHAREYE ACUTIFRONS			*+- -	-+	-
	POLYDORA SOCIALIS	- -		- + -	*-	.---
	PALEONOTUS HETEROSETA			* - -	**	*
6	[illegible]	**		*	*	*
	[illegible]			*	+	-+
	[illegible]	* *				* *
	[illegible]					*
	[illegible]	- - * -		--+-+-		* -



Symbols indicate intervals on a standardized scale of 0 to 1

- = ≤ 0
• = 0-0.25
– = 0.25-0.50
+ = 0.50-0.75
* = ≥ 0.75

2

Table 21

Two-Way Table, November-January Benthic Data

SITES

SPECIES	Species group	Site group 1 (sites 2-3, 2-4, 2-2, 15-1, 15-3, 15-2, 2-5, 15-5, 15-4)	Site group 2 (sites 2-1, 12-3)	Site group 3 (sites 27-2, 27-5, 12-1, 27-3, 12-5, 27-4, 14-4, 14-5, 14-2, 12-2, 12-4, 27-1)	Site group 4 (sites 14-1, 14-3)
PRIONOSPIO TREADWELLI	1		*		
DISPIO UNCINATA	1		*		
ANADARA TRANSVERSA	1	--+--	*	-	
BRANCHIOSTOMA CARIBAEUM	1	-+-	*+	-	--
MELINNA MACULATA	1	+ + +	*		
ANAITIDES ERYTHROPHYLLUS	1	- - * -	+-	-	-
ELECTRA SP (COLONIES)	1	+	*+	+	+
BUNODACTIS TEXENSIS	1	+*--*	*	--	
MALACOCEROS SP	1	* *	*	*	
PSEUDOPOLYDORA SP	1	-- * *	-	-- -	
NEMERTEA (YELLOW & PURPLE)	2	+++-+-*+	-	- - -	
AMPHARETE (EYES)	2	****+ *-	*	- - *-	
NATICA PUSILLA	2	++ *****	++	+	
OWENIA FUSIFORMIS	2	++ *****	*+	+ *+	
PRIONOSPIO CIRRIFERA	2	***-+	--	- -+	-
ANACHIS OBESA	2	-++ -+*			
OGYRIDES LIMICOLA	2	+ +++		-	
NEREIS SUCCINEA	2	--+-+++•-	*	- --+-	*+
NEMERTEA (YELLOW BANDED)	2	***-+*++-	++	-----+•-	--
SPIOCHAETOPTERUS OCULATUS	2	++•-+*---	+-	••• •••• -+	•-
COROPHIUM ACHERUSICUM	2	--++**••-	+	••• •	-
ABRA AEQUALIS	2	••+-*-- •	-+	•••- •• •-	•-
SPIOPHANES BOMBYX	2	••--+-- •	-*		-•
PAGURUS ANNULIPES	2	--+ --- -	-*	---+ - +-	++
MULINIA LATERALIS	2	* ---*+-+-		-	
NASSARIUS ACUTUS	2	- -**--*-	--		--
PSEUDEURYTHOE AMBIGUA	2	•----- **	•	•	
GLYCINDE SOLITARIA	2	-++*** *		- - - -	
HEMIPHOLIS ELONGATA	2	-*- +- -*	--	-+-- -+ *	
PHORONIS ARCHITECTA	2	++- - ++*	-+	- -- -	+-
NOTOMASTUS LATERICEUS	2	*+- +- **	-	- * -	-
CIRRATULUS HEDGPETHI	2	- *•- •	••	• ••• •	•
PINNIXA LUNZI	3	-- -*			+
THALASSEMA HARTMANI	3	-*	--		
PARAMYA SUBOVATA	3	-•*		*	
LUMBRINERIS TENUIS	4	++++---+-	•-	++++-++++*-*	**
CEREBRATULUS LACTEUS	4	-*-------	•-	--+--•---+**	*-
DIOPATRA CUPREA	4	-+--+*-+*	+-	-*****++-***	+-
NEREIS SP	4	++*-++-**	+*	++++*••--+**	--
NUCULANA CONCENTRICA	4	+--------	••	******+-**-**	+
SIGAMBRA TENTACULATA	4	•-****---	-•	---+-+ • -++	-+
SIGAMBRA WASSI	4	•-•*+* -•	-	+---*--- *+-	--
PINNIXA CRISTATA	4	-+•••••-*	-•	•••• -•- --+	**
AMPELISCA ABDITA	4	---•••-	-	-++-- +++++•	**
NINOE NIGRIPES	4	-+ ---		+++-++*****-	*-
VITRINELLA HELICOIDEA	4	- + +		*- --+- - -*	
PRIONOSPIO PINNATA	4	*********	••	•-•••••--•	••
MEDIOMASTUS CALIFORNIENSIS	4	***-*+-•-	+-	•••••••-••	•-
MAGELONA SP	4	+***-+++*	+-	-+++-+-+++++	++
GIANT SPERM	5	- -	-	+-+*	
CLYMENELLA TORQUATA CALIDA	5		+	*++ +	
MAGELONA ROSEA	5	++ +	+	+*+++	*
ANCISTROSYLLIS HARTMANAE	5	+ *	+	* +	
NEMATODA	5	- - -	*	+ - --	
POLYDORA SOCIALIS	5		*	-	
GYPTIS VITTATA	5	-- - -	*	- -*	
POLYGORDIUS SP.	5		*	••	
LEPIDONOTUS SUBLEVIS	6	*		**	*
PALEONOTUS HETEROSETA	6			**	**
CALLIANASSA ACANTHOCHIRUS	6	*		** **	*
PHASCOLION STROMBI	6	++ + +		+*	
ARICIDEA SP	6	*+		+ + +	+
THARYX SETIGERA	6	*		* **	**
STHENELAIS BOA	6	+-	-	*- + -*	-
AMPHIPODA, UN ID	6			- -*	-
NEOPANOPE TEXANA	6	* *		*	*
CALLIANASSA LATISPINA	6			* +++	
NEPHTYS BUCERA	6	* *		****	
CERATOCEPHALE SP.	6			++ +	*
PARANTHUS RAPIFORMIS	6	*		* **	
CORBULA BARRATTIANA	6	*		+**+ + *+	+
ASYCHIS ELONGATA	6			+* -- +*+- -	
NEPHTYS INCISA	6			+ + + *++	
MICROPHOLIS ATRA	6	*		* ** *	
ANCISTROSYLLIS JONESI	7	-**--**-+		--++---+----	-
COSSURA DELTA	7	**•• *+		•-- +••----	-•
CLYMENELLA ZONALIS	7	**--++ -		-- - -- --	-
NEMERTEA (WHITE)	7	***	-	++---* -	*+
AGLAOPHAMUS VERRILLI	7	* ++	+	*+* *	+*
LEPIDASTHENIA SP	7	•+-•• --		• • -••- -	*+
TELLINA VERSICOLOR	7	- - - -	-	--* --++	*+
BALANOGLOSSUS	7	- •• +		• • • -	+*
MESOCHAETOPTERUS TAYLORI	7				*+
ELASMOPUS RAPAX	7	*+		- - +-	+*
LISTRIELLA SP	7	--		- + -*	*+
GLYCERA AMERICANA	7	*+++	-	+ + + +	*+
OXYUROSTYLIS SALINOI	7	-- -	-	-	*
ARMANDIA AGILIS	7	-	--	- - *++--	+
BATEA CATHARINENSIS	7	+ -* -	*	- - -	+
CLYTIA CORONATA (COLONIES)	7	+ + +		+	*

MALACOCEROS SP		* *	*	*	
PSEUDOPOLYDORA SP		-- * +	-	-- -	
NEMERTEA (YELLOW & PURPLE)		++*-+-*+	-	- - -	
AMPHARETE (EYES)		*****+ *-	*	- - *-	
NATICA PUSILLA		++ *++++	++	+	
OWENIA FUSIFORMIS		+* *****	*+	+ *+	
PRIONOSPIO CIRRIFERA		***+-+	--	- -+	-
ANACHIS OBESA		-++ -+*			
OGYRIDES LIMICOLA		+ ++*		-	
NEREIS SUCCINEA		--+-+++.-	*	- --+-	*+
NEMERTEA (YELLOW BANDED)		***-+*++-	++	-----+.-	--
SPIOCHAETOPTERUS OCULATUS		++.-+*---	+-	... . -+	.-
COROPHIUM ACHERUSICUM	2	--+++*..-	+	... .	-
ABRA AEQUALIS		..+-*-- .	-+	...- .. .-	.-
SPIOPHANES BOMBYX		..--+-- .	-*		-.
PAGURUS ANNULIPES		--+ --- -	-*	---+ - +-	++
MULINIA LATERALIS		*.--*+-+-		-	
NASSARIUS ACUTUS		- -**--*-	--		--
PSEUDEURYTHOE AMBIGUA		.----- **	.	.	
GLYCINDE SOLITARIA		-++++* *		- - - -	
HEMIPHOLIS ELONGATA		-*- +- -*	--	-+-- -+ *	
PHORONIS ARCHITECTA		++- - ++*	-+	- -- -	+-
NOTOMASTUS LATERICEUS		*+- +- **	-	- * -	-
CIRRATULUS HEDGPETHI		- *.- .	..	. ... .	.
PINNIXA LUNZI		-- -*			+
THALASSEMA HARTMANI	3	-*	--		
PARAMYA SUBOVATA		-.*		*	
LUMBRINERIS TENUIS		++++---+-	.-	++++-++**-*	**
CEREBRATULUS LACTEUS		-*--------	.-	--+--.---+**	*-
DIOPATRA CUPREA		-+--+*-+*	+-	-*+*++++-**+	+-
NEREIS SP		++*-++-**	+*	+++++*..--+*+	--
NUCULANA CONCENTRICA		+---------	..	*****+-**-**	+
SIGAMBRA TENTACULATA		.-****---	-.	---+-+ . -++	-+
SIGAMBRA WASSI		.-.*++ -.	-	+---*--- *+-	--
PINNIXA CRISTATA	4	-+.....-*	-.	.... -.- --+	**
AMPELISCA ABDITA		---...-	-	-++-- +++++.	**
NINOE NIGRIPES		-+ ---		+++-++****-	*-
VITRINELLA HELICOIDEA		- + +		*- --+- - -*	
PRIONOSPIO PINNATA		*+*++++*	..	.-.......--.	..
MEDIOMASTUS CALIFORNIENSIS		***-*+-.-	+-	........-..	.-
MAGELONA SP		+**+-+++*	+-	-+++-+-+++++	++
GIANT SPERM		- -	-	+-++	
CLYMENELLA TORQUATA CALIDA			+	*++ +	
MAGELONA ROSEA		++ +	+	+*+++	*
ANCISTROSYLLIS HARTMANAE	5	+ *	+	* +	
NEMATODA		- - -	*	+ - --	
POLYDORA SOCIALIS			*	-	
GYPTIS VITTATA		-- - -	*	- -*	
POLYGORDIUS SP.			*	..	
LEPIDONOTUS SUBLEVIS		*		**	*
PALEONOTUS HETEROSETA				**	**
CALLIANASSA ACANTHOCHIRUS		*		** **	*
PHASCOLION STROMBI		++ + +		+*	
ARICIDEA SP		*+		+ + +	+
THARYX SETIGERA		*		* **	**
STHENELAIS BOA		+-	-	*- + -*	-
AMPHIPODA, UN ID				- -*	-
NEOPANOPE TEXANA	6	* *		*	*
CALLIANASSA LATISPINA				* +++	
NEPHTYS BUCERA		* *		****	
CERATOCEPHALE SP.				++ +	*
PARANTHUS RAPIFORMIS		*		* **	
CORBULA BARRATTANIA		*		+**+ + *+	+
ASYCHIS ELONGATA				+* -- +*+- -	
NEPHTYS INCISA				+ + + *++	
MICROPHOLIS ATRA		*		* ** *	
ANCISTROSYLLIS JONESI		-**--**-+		--++---+----	-
COSSURA DELTA		**.. *+		.-- +..----	-.
CLYMENELLA ZONALIS		**--++ -		-- - -- --	-
NEMERTEA (WHITE)		***	-	++---* -	*+
AGLAOPHAMUS VERRILLI		* ++	+	*+* *	+*
LEPIDASTHENIA SP		.+-.. --		. . -..- -	*+
TELLINA VERSICOLOR		- - - -	-	--* --++	*+
BALANOGLOSSUS		- .. +		. . . -	+*
MESOCHAETOPTERUS TAYLORI	7				*+
ELASMOPUS RAPAX		*+		- - +-	+*
LISTRIELLA SP		--		- + -*	*+
GLYCERA AMERICANA		*+++	-	+ + + +	*+
OXYUROSTYLIS SALINOI		-- -	-	-	*
ARMANDIA AGILIS		-	--	- - *++--	+
BATEA CATHARINENSIS		+ -* -	*	- - -	+
CLYTIA CORONATA (COLONIES)		+ + +		+	*

Symbols indicate intervals on a standardized scale of 0 to 1

= ≤ 0

. = 0-0.25

- = 0.25-0.50

+ = 0.50-0.75

* = ≥ 0.75

2

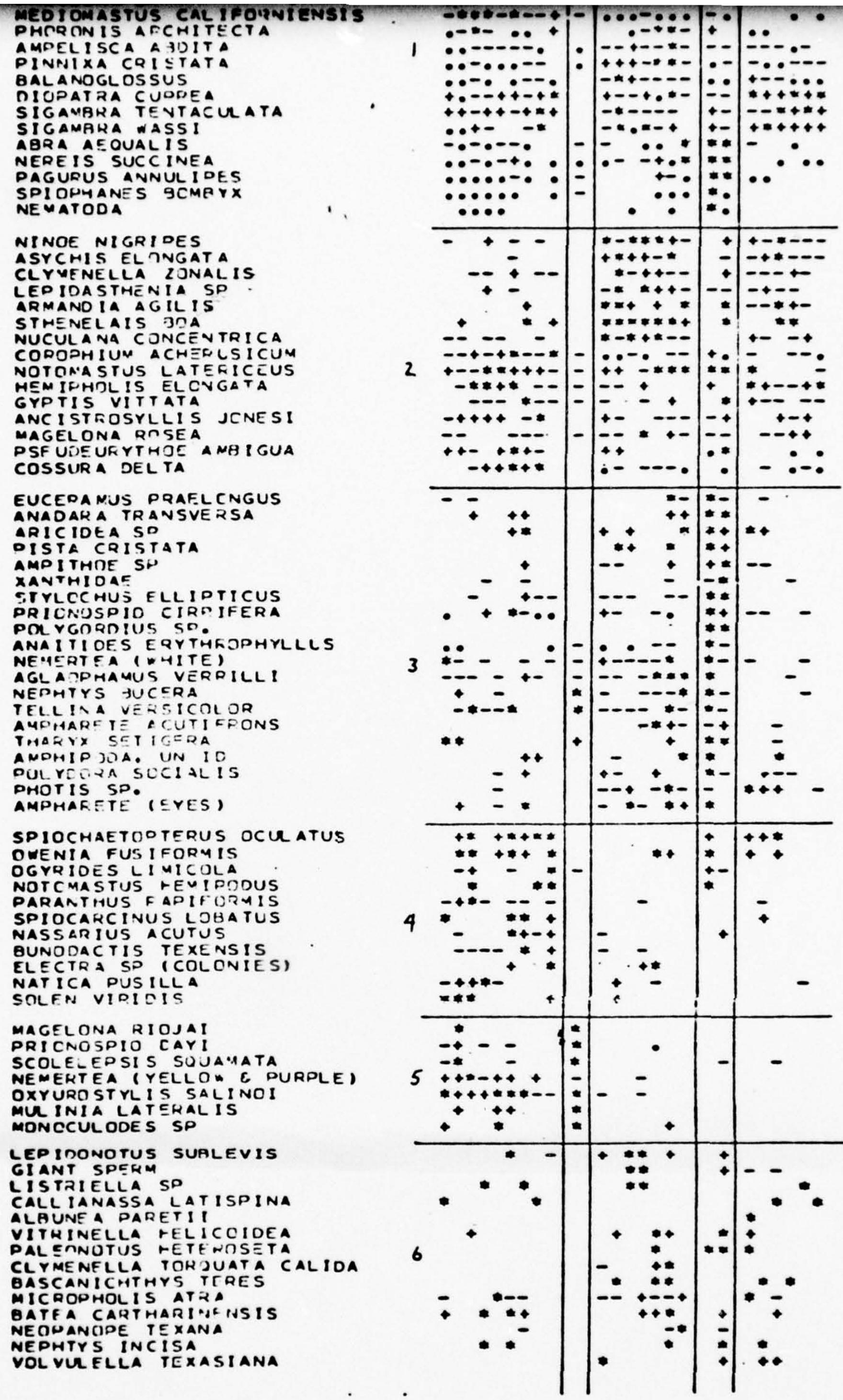
Table 22

Two-Way Table, March-May Benthic Data

SITES

SPECIES	Species group	Site group 1 (2-3, 15-2, 15-3, 15-4, 2-5, 15-5, 2-2, 2-4, 15-1)	Site group 2 (2-1)	Site group 3 (12-1, 12-5, 14-2, 12-2, 14-3, 14-5, 14-1)	Site group 4 (12-3, 12-4)	Site group 5 (14-4, 27-2, 27-4, 27-3, 27-5, 27-1)
GLYCINDE SOLITARIA	1	*++++***+-	-	-+-+---	--	-+•-+
GLYCERA AMERICANA	1	*+*+++*++	-	+*--*+-	++	--+•-
NEMERTEA (YELLOW BANDED)	1	********+	+	++--+++	*+	-• •
LUMBRINERIS TENUIS	1	+-++++---	•	+**+**+	+-	+++++-
CEREHRATULUS LACTEUS	1	+-++++-+-	-	*++***-	++	+++++*
NEREIS SP	1	*-++-**-*	+	++-+-++	*+	-----+
PRIONOSPIO PINNATA	1	+*+++***-	-	------•	-•	-••••
MAGELONA SP	1	++++++*++	-	++-*---	--	-+--+-
MEDIOMASTUS CALIFORNIENSIS	1	-***-*--+	-	•••-•••	-•	• •
PHORONIS ARCHITECTA	1	•-*- •• +		•-**-	+	••
AMPELISCA ABDITA	1	••-----•	•	--+--*-	--	---•-
PINNIXA CRISTATA	1	••-•••--	•	+++-**-	•-	-••---
BALANOGLOSSUS	1	••-• •--•		-*+----	••	+--•••
DIOPATRA CUPREA	1	+•--++-+*		+--+•*-	--	****+*
SIGAMBRA TENTACULATA	1	++-++-+*+		-*----	+-	--*+*+
SIGAMBRA WASSI	1	••+- -*		-*•*-+	+-	+*++++
ABRA AEQUALIS	1	-•-•--•	-	- •• *	**	- •
NEREIS SUCCINEA	1	••-•-+• •	•	•- -+•*	**	• ••
PAGURUS ANNULIPES	1	•••••-• •	-	+-•	**	••
SPIOPHANES BOMBYX	1	•••••• •	-	•••	*•	
NEMATODA	1	••••		• •	*•	
NINOE NIGRIPES	2	- + - -		*-****+-	+	+-*---
ASYCHIS ELONGATA	2	-		+***-*	-	-+*---
CLYMENELLA ZONALIS	2	-- + --		*-++--	+	---+-
LEPIDASTHENIA SP	2	+ -		-* ***-	--	-+--
ARMANDIA AGILIS	2	+		*** + *	*	--*+-
STHENELAIS BOA	2	+ * +		******+	*	**
NUCULANA CONCENTRICA	2	-- -- -		*-*+*--		+- -+
COROPHIUM ACHERUSICUM	2	--+-+*--*	-	••-• --	+•	- --•
NOTOMASTUS LATERICEUS	2	+--*+*+-	-	++ -***	**	* -
HEMIPHOLIS ELONGATA	2	-***+ --	-	-- +	+	*+--+*
GYPTIS VITTATA	2	--- *--	-	- - +	*	+-- --
ANCISTROSYLLIS JONESI	2	-++++ -*		+- ---	-+	+-+
MAGELONA ROSEA	2	-- ---	-	-- * +-	--	--++
PSEUDEURYTHOE AMBIGUA	2	++- +*+-		++	•*	• •
COSSURA DELTA	2	-+**++		•- ---•	•	- •-•
EUCERAMUS PRAELONGUS	3	- -		*-	*-	-
ANADARA TRANSVERSA	3	+ ++		++	**	
ARICIDEA SP	3	+*		+ + *	*+	*+
PISTA CRISTATA	3			*+ *	*+	
AMPITHOE SP	3	+		-- +	+*	--
XANTHIDAE	3	- -		-	-*	-
STYLOCHUS ELLIPTICUS	3	- +--		--- --	**	
PRIONOSPIO CIRRIFERA	3	• + *-••		+- -•	*+	-- -
POLYGORDIUS SP.	3				**	
ANAITIDES ERYTHROPHYLLUS	3	•• •	-	• • --	*-	
NEMERTEA (WHITE)	3	*- - - -	-	+----*	*-	- -
AGLAOPHAMUS VERRILLI	3	--- - +-	-	-- -***	*	-
NEPHTYS BUCERA	3	+ -	*	- ---*	*-	-
TELLINA VERSICOLOR	3	-*--*	*	---- *-	*-	
AMPHARETE ACUTIFRONS	3			-*+-	-+	-
THARYX SETIGERA	3	**	+	+	**	-
AMPHIPODA, UN ID	3	++		- *	*	*
POLYDORA SOCIALIS	3	- +		+- +	*-	•--
PHOTIS SP.	3	-		--+ -*-	-	*++ -
AMPHARETE (EYES)	3	+ - *		- *- *+	*	
SPIOCHAETOPTERUS OCULATUS	4	+* +*+**			+	++*
OWENIA FUSIFORMIS	4	** +*+ *		*+	*	+ +
OGYRIDES LIMICOLA	4	-+ - *	-		+-	
NOTOMASTUS HEMIPODUS	4	* **			*	
PARANTHUS RAPIFORMIS	4	-+*- -- -		-		-
SPIOCARCINUS LOBATUS	4	* ** +				+
NASSARIUS ACUTUS	4	- *+-+		-	+	
BUNODACTIS TEXENSIS	4	---- * +		- -		
ELECTRA SP (COLONIES)	4	+ *		+*		
NATICA PUSILLA	4	-++*-		+ -		-
SOLEN VIRIDIS	4	*** +		+		
MAGELONA RIOJAI	5	*	*			
PRIONOSPIO CAYI	5	-+ - -	*	•		
SCOLELEPSIS SQUAMATA	5	-* -	*		-	-
NEMERTEA (YELLOW & PURPLE)	5	++*-++ +	-	-		
OXYURDSTYLIS SALINOI	5	*++++***--	*	- -		
MULINIA LATERALIS	5	+ ++	*			
MONOCULODES SP	5	+ *	*	+		
LEPIDONOTUS SUBLEVIS	6	* -		+ ** +	+	
GIANT SPERM	6			**	+	- -
LISTRIELLA SP	6	* *		**		*
CALLIANASSA LATISPINA	6	* *				* *
ALBUNEA PARETII	6					*
VITRINELLA HELICOIDEA	6	+		+ *+	*	+
PALEONOTUS HETEROSETA	6			*	**	*
CLYMENELLA TORQUATA CALIDA	6			- +*		
BASCANICHTHYS TERES	6			* **		* *
MICROPHOLIS ATRA	6	- *--		-- +--+		* -
BATEA CARTHARINENSIS	6	+ * *+		++*	+	+
NEOPANOPE TEXANA	6	-		-*	-	
NEPHTYS INCISA	6	* *		*	*	*
VOLVULELLA TEXASIANA	6			*	+	++

Symbols indicate intervals on a standardized scale of 0 to 1



Symbols indicate intervals on a standardized scale of 0 to 1

■ = ≤ 0
• = 0–0.25
– = 0.25–0.50
+ = 0.50–0.75
✱ = ≥ 0.75

2

Table 23

Two-Way Table, July Benthic Data

SITES

SPECIES	Species group	1 (27-1, 27-2, 27-4, 27-3, 27-5, 2-3, 12-2, 12-5)	2 (14-3, 14-4, 14-2, 14-5)	3 (15-2, 15-3, 2-2)	4 (15-4, 2-4, 12-3, 12-4, 15-1, 12-1, 15-5)	5 (2-5, 14-1)	6 (2-1)
PRIONOSPIO PINNATA	1	--------•	--••	+++	+*-•-+*	-•	•
MEDIOMASTUS CALIFORNIENSIS	1	----•+••	-•••	---	-+-•--*	--	•
MAGELONA SP	1	+++-++++	*++-	++-	+++-**+	++	-
DIOPATRA CUPREA	1	+-+-----	----	+--	----*++	-+	-
CEREBRATULUS LACTEUS	1	**-**+--	---+	-•-	-*-*+--	-+	-
LUMBRINERIS TENUIS	1	-------	*+*+	-•-	--+-*--	+*	
ABRA AEQUALIS	1	--+----+	+---	•••	----+--	*	*
NEREIS SP	1	•-•• •-	+- •	••-	----++*	--	*
AMPELISCA ABDITA	1	+--*+ *	*++-	--	-**++++	-+	+
NEMERTEA (YELLOW BANDED)	1	+- --*+-	--+	+-	-**+*+-	*+	-
SIGAMBRA TENTACULATA	1	+*+** •	*---	---	•*•+ -	-	
GLYCINDE SOLITARIA	1	+- -+ ++	*-++	++*	+*+-*+	--	
HEMIPHOLIS ELONGATA	1	-	•-	•	------**	-*	•
NEREIS SUCCINEA	1	• --	-	--	-+•-*++		•
NOTOMASTUS LATERICEUS	2	-			- - *	*-	
NEMERTEA (YELLOW & PURPLE)	2	*		+	++ *	*+	
GLYCERA AMERICANA	2	-	+		* + --	++	
ANCISTROSYLLIS JONESI	2	+-+*+*++	--	- -	-+ -	--	
CLYMENELLA ZONALIS	2	--	- -	---	- -	*+	
SPIOCHAETOPTERUS OCULATUS	2	----		-	- -**-		
BUNODACTIS TEXENSIS	2	+	•	++	***	+	
ANADARA TRANSVERSA	2	• +	•		•••*-	•	
PSEUDEURYTHOE AMBIGUA	2	+		* *	+* + *		
OWENIA FUSIFORMIS	2		+ -	-	+*++++*-	+	-
SPIOPHANES BOMBYX	2	•		•	*	-	•
PARANTHUS RAPIFORMIS	2	-			*+		-
AGLAOPHAMUS VERRILLI	2	+		*+	*	+	
THARYX SETIGERA	2	+		+	**	+	
LEPIDASTHENIA SP	3	• •	• •-	•	-•	*	
PINNIXA CRISTATA	3	• • •	- -		•+ ••	*	
BALANOGLOSSUS	3	•• •	•• •	•	• • •	*	
PARAMYA SUBOVATA	3	+			+	*	
NUCULANA CONCENTRICA	3	++•-----	**+-		•+	-	
SIGAMBRA WASSI	3	--•-++-•	- •-		+	*	
KINBERGONUPHIS NIGRIPES	3	--- +-	***-		---+-	+	
VOLVULELLA TEXASIANA	3	-*+	****		-	-	
AMPHARETE (EYES)	3	-+-	*++		--	-	
ANACHIS OBESA	3	+ ++	*+++			++	
PHASCOLION STROMBI	4	+	++ +		+ +*	*	
TEREBRA PROTEXTA	4	-	--		- *--		
STHENELAIS BOA	4	*+ +	+* +		+ *+*+		
VITRINELLA HELICOIDEA	4	--+*+	+ --		+ +		
SQUILLA EMPUSA	4	* *	* *		*		
LUNARCA OVALIS	4	*	+*		* *		
AMPHARETE ACUTIFRONS	4	+	**		+		
ASYCHIS ELONGATA	4	+ +	*		+ +		
LISTRIELLA SP	4	++* *+					
GYPTIS VITTATA	4	* **	*	*	*		
BRANCHIOSTOMA CARIBAEUM	5						*
MAGELONA RIOJAI	5	-			-		*
ELECTRA CRUSTULENTA (COL)	5				-. *		+
MAGELONA ROSEA	5	-	--		-		*
ELECTRA SP (COLONIES)	5	- *			-*		-
MICROPHOLIS ATRA	5		*+++	-	- -	**	*
NEPHTYS BUCERA	5		-		-	-+	*
PHORONIS ARCHITECTA	5	-	-• -		••- •	-*	-
MYSELLA PLANULATA	5	•	- *			*	+
NASSARIUS ACUTUS	5	- --	*+ -	-	++-+ --	*	+
NATICA PUSILLA	5	-- -	*		+- -*-	+	+
COSSURA DELTA	5	+-+--*+-	* -		+ -	-	-
ARICIDEA SP	5	**-----			- - -	--	-
TELLINA IRIS	5	+** +			*	+	+

Symbols indicate intervals on a standardized scale of 0 to 1

(blank) = ≤ 0
• = 0–0.25
− = 0.25–0.50
+ = 0.50–0.75
* = ≥ 0.75

Table 24

Two-Way Table, September Benthic Data

SITES

	SPECIES	14-1	12-2	2-4	2-5	12-5	2-3	15-5	12-4	14-2	27-5	14-5	27-3	12-1	2-2	15-2	15-3	15-4	15-1	2-1	12-3	27-1	27-4	27-2	14-3	14-4
								1										2							3	
1	THALASSEMA HARTMANI																-	*								
1	PINNIXA LUNZI			+													+	*								
1	CLYMENELLA ZONALIS		-			-	-	*		-					-		-									
1	CALLIANASSA LATISPINA			*			*									*	*									
1	ARICIDEA SP	*	*									*					*									
1	PARAMYA SUBOVATA		*	-														+								
1	HEMIPHOLIS ELONGATA	-	*	+	-	-		-			+							+	-							
1	TEREBRA PROTEXTA	+	+		+		*	*			+					+		+								
1	STHENELAIS BOA		+		+													*								
1	BUNODACTIS TEXENSIS			+						*								+								
2	OWENIA FUSIFORMIS	-	*	+	+	*		*		-		+	-		-	+		+		*						
2	NEREIS SUCCINEA		+		-			*		-			-		+	-			-	*						
2	NOTOMASTUS LATERICEUS			-	-	-											-			*						
2	SPIOCARCINUS LOBATUS	-	-	*								-								*						
2	OXYUROSTYLIS SALINOI			-		*									-	-		*	*							
2	SPIOCHAETOPTERUS OCULATUS	+		+	+	*								*	*	+		*								
2	PHASCOLION STROMBI					+					*				+	+										
2	AMPHARETE (EYES)	*	*												*				*							
2	MICROPHOLIS ATRA	+	+			+		+	+																*	
2	GIANT SPERM		*																						+	
2	NEPHTYS BUCERA		+		+	*																				
2	PAGURUS ANNULIPES		+		*						+															
3	PRIONOSPIO PINNATA	•	-		•	-	+	-	•		-			•	+	*	*	-	+	-	-			•	•	
3	MEDIOMASTUS CALIFORNIENSIS	*	-	•	+	•	+	+		-	+	-	•	-	+	*	+	+	*	-	+			-	•	•
3	MAGELONA SP	*	*	*	+	*	+	*	+	-	+	-	-	-	•	+	-	*	-	-	-	•	•	•	•	•
3	DIOPATRA CUPREA	+	+	*	-	-	•	+	+	+	-	-	-	-	+	+	-	-	-	-	-	-	+			-
3	LUMBRINERIS TENUIS	*	*	*	*	*	•	*	+	*	-	+	-	-			-	-		-	-				•	
3	NEREIS SP	-	-	-	•	+	•	-	•	•	•	•	•	•		•	•	-	*	•	•		•			
3	PHORONIS ARCHITECTA	-	*	-	*	+											-	-	*	-	-					-
3	TELLINA IRIS		-			*			-	+							-		+							
3	CEREBRATULUS LACTEUS	*	*	-	-	*	*	*	+	*	-	+	+		+	-		*				-	-		+	-
3	COSSURA DELTA	+	+	+	-	*	*	*	+		+	-		-	-			-		-		-	-		-	
3	NINOE NIGRIPES	+	*	+	-	+	-	-	+	+	-	+		-		+		-							-	
3	NUCULANA CONCENTRICA	*	+	+	-	*	-	-		*	*	+	-	-	-	+				-		-	+	-		
3	SIGAMBRA WASSI	-	-	-	-	*		+	*		+		-	-		+		-				-	-	+	-	
3	ANCISTROSYLLIS JONESI	-	+	*	+	+	-	*	+			*	*	-				-				-		-		
3	VITRINELLA HELICOIDEA	*	+		-				*	*	*											+	-	*		-
3	AMPELISCA ABDITA	+	+	-	-			-		*	+	+	-	+		-			-							
3	MAGELONA ROSEA					+		+		*	+	+		+												
3	ARMANDIA AGILIS				-	+	*			-				-		-										
3	ABRA AEQUALIS	+							*	*	+	+	+							*	+				+	
3	VOLVULELLA TEXASIANA					+					*	+	+										+			
4	PSEUDOPOLYDORA SP			-			-	-									*	*		-	-					
4	PSEUDEURYTHOE AMBIGUA				+		-					-	-			*	+	*			+					
4	NASSARIUS ACUTUS			+			-				*					-	+	*		+			-	-		
4	GLYCINDE SOLITARIA	-	-	-	-		-	+	-			-			+	*	+	-		+						
4	NEMERTEA (YELLOW BANDED)	*	+	-	-	+	-	-	-	-	-				*	*	-				+					-
4	SIGAMBRA TENTACULATA	+	+							*	-	*				*	*						-			
4	NEMERTEA (YELLOW & PURPLE)						+	+	+							*										
4	PINNIXA CRISTATA	•		-	•	•	-				•	-	•		•	-	+	*	-							•
4	LEPIDASTHENIA SP		+	-			+	+			+	*					+	*								-
4	BALANOGLOSSUS	•					-					*	•			•		•								•
4	CLYTIA CORONATA (COLONIES)											+														*
5	NATICA PUSILLA			-							*	-												-		
5	ANACHIS OBESA					+					*													+		
5	MAGELONA RIOJAI			*								*							*					*		
5	ANTICLIMAX PILSBRYI					*	*			*														*		
6	CLYMENELLA TORQUATA CALIDA					*												*			*					
6	GYPTIS VITTATA	*	*																		*					
6	ANADARA TRANSVERSA	*	-	*	*							-				-					*					
6	GLYCERA AMERICANA	*		*		*										*				*	*					
6	CAECUM GLABRUM																				*					
6	ELECTRA SP (COLONIES)						+								*						*					

Symbols indicate intervals on a standardized scale of 0 to 1

= ≤ 0

• = 0-0.25

\- = 0.25-0.50

\+ = 0.50-0.75

* = ≥ 0.75

Table 25

Two-Way Table, November Benthic Data

Species group	SPECIES	15-2	15-3	2-2	15-1	2-3	2-4	2-5	15-5	2-1	15-4	14-3	12-3	12-5	14-5	27-5	14-1	14-4	14-2	12-2	12-4	27-3	12-1	27-1	27-2	27-4
	SITES (site group)	1								2			3		4											
1	DIOPATRA CUPREA	-	+	-	-	-	+		-	-	*	-	-	-	+	*	+	-	-	+	*	+	-	-	•	-
	NEREIS SP	-	-	-	•	-	-	-	+	+	+	•	+	*	-	+	-	•	-	-	*	-	-	-	•	-
	LUMBRINERIS TENUIS	-	+	+	+	+	+	-	+	•	+	+	+	+	*	*	+	*	*	*	-	+	-	+	+	+
	CEREBRATULUS LACTEUS	-	•	-	•	-	*	•	-	•	•	-	-	•	-	-	+	-	-	-	*	-	-	*	•	•
	NUCULANA CONCENTRICA	-	-	-	+	+	-	-	+	-	-		-	-	*	+	+	-	+	-	*	*	*	*	*	+
	PINNIXA CRISTATA	•		•		-	+	•	-	-	*	*	•		-	•	-	•			•	•		+	•	-
	SIGAMBRA TENTACULATA	*	*	-	*			-	-	-		-	-	+	-	-	-			-	+	+		+	-	-
	SIGAMBRA WASSI	*	-	•	*		•		-					*		•	-	-		•	+	-	•	-	-	
	ANCISTROSYLLIS JONESI	*	-	*	-	-	*	-	-		+			-	+	-	-	-			+	-	+	-		
	COSSURA DELTA				-	-	*	+	*			-			-	-		-	+		-	-	-	+		*
	NINOE NIGRIPES						*		+		-				*	*	*	*	*	*	*	-	*	+	*	*
	VITRINELLA HELICOIDEA				+		-				+								-			-		-	*	+
2	PRIONOSPIO PINNATA	*	*	*	*	*	+	*	+	-	-	•	•	•	•	•	•	•	•	•	-	•	•	•		•
	MEDIOMASTUS CALIFORNIENSIS	*	*	+	-	-	-	-	•	+	-	•	•	•			•	•	•	•	•	•		•		•
	MAGELONA SP	+	+	*	+	+	*	+	-	*	*	+	-	-	*	*	+	+	*	+	+	+	-	*	-	*
3	NEREIS SUCCINEA	+	+	+	-	-	-	-		*	-	-		-	•		-		-	-						
	SPIOCHAETOPTERUS OCULATUS	*	*			-	-	-	+	*	+	+	-	-	-	-					-					-
	NEMERTEA (YELLOW BANDED)	*	+	+	-	-	-	*	*	-	-		+	-	+		-	+	-	-	-			-		-
	HEMIPHOLIS ELONGATA		+			-	*			-	*		-		+	+		-		+			-			
	CIRRATULUS HEDGPETHI	•	*				-	-		•	•		•		•		•	•					•	•		•
	PSEUDEURYTHOE AMBIGUA	-	-	•	•		•		*	•	+															
	ANADARA TRANSVERSA		-	-	-	-	-			*											-					
	COROPHIUM ACHERUSICUM			+	+	+	+			*	*															
	PRIONOSPIO CIRRIFERA		*	*						*				*												
	NATICA PUSILLA	+			*		+	+	+	+			+											+		
	OWENIA FUSIFORMIS	*					+			*			+			+					+					
4	CLYMENELLA ZONALIS	*	*	+	-	*	+		+						+				-		-	-	-			
	NEMERTEA (YELLOW & PURPLE)	-	+	*	-	+	-	+	*				-		-						-					-
	GLYCINDE SOLITARIA	*	+	*	+	-					+													-		
	MULINIA LATERALIS	*	-	-	*				*																	
	PSEUDOPOLYDORA SP	*		-	-						*							-			-					-
	PAGURUS ANNULIPES	-	-	-				-			-	*	*			-			-					-		
	NASSARIUS ACUTUS	+	+	*	*	+		+				+	+													
	LEPIDASTHENIA SP		-	+		-	*		+		+	*			-		+		-	+				+	-	
	ABRA AEQUALIS	-	-	-	-		-					*				-	-	-	-	*		*			+	-
	GLYCERA AMERICANA		*	*	*										*			•		*					*	
	ANACHIS OBESA			*			*	*																		
	MELINNA MACULATA		*			*		*																		
	OGYRIDES LIMICOLA				+	*									+											
	PHASCOLION STROMBI				*	*					*															
	AMPHARETE (EYES)			*	+	+			+																	
	GYPTIS VITTATA				-				-														-	*		
5	OXYUROSTYLIS SALINOI						+					*			+											
	MONOCULODES SP											*						+						+		
	ARMANDIA AGILIS						*			+		+												+		
	ARICIDEA SP										*	*												*		
	BATEA CAPTHARINENSIS						*			+	+	*							-							
	CLYTIA CORONATA (COLONIES)		+			+					+	*							+							
	ELASMOPUS RAPAX					*	+					*			+	-	+		-			-				
	NEMERTEA (WHITE)			-		+	*					-			-		-									-
	AMPELISCA ABDITA			-	•	-	-					*		-	+	+	+	-	-	•		•		•		
	BALANOGLOSSUS		•				-		*			*														•
	TELLINA VERSICOLOR											+		*	-			-	*	-			-			
	LISTRIELLA SP											*		*	*	*										
6	MAGELONA ROSEA						+						+		+		*	+	+							
	CLYMENELLA TORQUATA CALIDA												+		+			*								
	GIANT SPERM	-					-						-		-			+	-	*						
	AGLAOPHAMUS VERRILLI						+						+	+								*				*
	ASYCHIS ELONGATA														*	*			+			+				
	CALLIANASSA LATISPINA																		*		*	*				
	VOLVULELLA TEXASIANA																+					*		*		
	ELECTRA SP (COLONIES)			*													*							*		
	PINNIXA LUNZI					-	-				*	+														
	PHORONIS ARCHITECTA					+	-				*				-		-	-								
	NOTOMASTUS LATERICEUS					-					*						-			*						
	CORBULA BARRATTIANA										*			+		+	+	+		+		*				
	NEPHTYS INCISA															•				*	+			+		
	AUTOMATE EVERMANNI															+				*			+			
	THARYX SETIGERA			*														*		*						

Symbols indicate intervals on a standardized scale of 0 to 1

= ≤ 0
• = 0–0.25
- = 0.25–0.50
+ = 0.50–0.75
* = ≥ 0.75

Table 26

Two-Way Table, January Benthic Data

SITES

Species group	SPECIES	Site group 1 (2-3, 2-4, 2-2, 15-1, 15-3, 15-2)	Site group 2 (12-1, 27-3, 2-5, 15-4, 15-5)	Site group 3 (14-3, 14-1, 12-4, 12-2)	Site group 4 (12-3, 2-1)	Site group 5 (27-5, 27-2, 27-4, 27-1, 14-4, 14-2, 14-5, 12-5)
1	PRIONOSPIO TREADWELLI				*	
	DISPIO UNCINATA				*	
	POLYDORA SOCIALIS				+	-
	GYPTIS VITTATA	--		-	*	
	POLYGORDIUS SP.			••	+	
	THALASSEMA HARTMANI		*		+*	
	ANACHIS OBESA	- -	*			
2	ABRA AEQUALIS	••--+•	• -•	--	-+	
	SPIOPHANES BOMBYX	••--+-	-•	-•	-*	
	NEMERTEA (YELLOW BANDED)	*+*--+	--	--+	*-	- ----
	BRANCHIOSTOMA CARIBAEUM	-+-		-- -	*+	
	COROPHIUM ACHERUSICUM	--+-**	••• •	- •	-	•
	NASSARIUS ACUTUS	+*-	-*	-	-	
	BATEA CATHARINENSIS	-*		-	+	-
	PAGURUS ANNULIPES	+-+ +-	-+	*- *	-*	-
	PHORONIS ARCHITECTA	+*+ -	- * *	*- -	+*	-
	SPIOCHAETOPTERUS OCULATUS	++---*	-	- ++	--	- -
	NEREIS SUCCINEA	+- +	- -	*+--	-	-
	NEMERTEA (WHITE)	- *	++	+- -	-	--*
	BUNODACTIS TEXENSIS	**+ *			+	+ +
	ANADARA TRANSVERSA	*--			-	
3	OWENIA FUSIFORMIS	+* **	* *	*		
	NEMERTEA (YELLOW & PURPLE)	+***++	*			
	AMPHARETE (EYES)	+*--+	- *	*-	*	-
	COSSURA DELTA	*--	--*	- --		
	GLYCINDE SOLITARIA	-+- +-	- *	-		- -
	NOTOMASTUS LATERICEUS	**+ *+	+ *	*	-	+
	SIGAMBRA TENTACULATA	-+** -	---+-	----		--++
	PSEUDEURYTHOE AMBIGUA	-*** +	- *+			
	CLYMENELLA ZONALIS	+* ---	- -	-		-- -
	ANAITIDES ERYTHROPHYLLUS	- - *	- -	-	+-	
	OXYUROSTYLIS SALINOI	+ +		*	+	
	MULINIA LATERALIS	* - *	- --			
	OGYRIDES LIMICOLA	- ++*				
4	NEREIS SP	++*+++	+--+*	--**	-+	+•- - -•
	CEREBRATULUS LACTEUS	--+•++	-•+-+	+++*	••	+•- --+-
	LUMBRINERIS TENUIS	------	-----	***-	-	--*-+--+
	DIOPATRA CUPREA	--•--*	-*+-+	- ++	-•	+**•-*--
	NUCULANA CONCENTRICA	- -	*+ --	-*		****-++
	NINOE NIGRIPES	-	-----	++*+		----+++*
	SIGAMBRA BASSI	•- •-•	-- ••	--*-	-	---- --
	PRIONOSPIO PINNATA	*-+---	- •*•	••-•	••	• • •
	MAGELONA SP	***+-+	+--++	-++-	•-	---•••-•
	MEDIOMASTUS CALIFORNIENSIS	**+---	••--	•--•	-	••
5	BALANOGLOSSUS	- •	•	+*-		•
	PINNIXA CRISTATA	- -•	-	*+-•	•	
	LEPIDASTHENIA SP	-		*+-		--
	MESOCHAETOPTERUS TAYLORI			*		
	LEPIDONOTUS SUBLEVIS	*		***		
	PALEONOTUS HETEROSETA			****		
	AGLAOPHAMUS VERRILLI	+ ++		+**	-	
	GLYCERA AMERICANA	*	+	*+	-	
	PRIONOSPIO CIRRIFERA	*** +		--+	-	
	AMPELISCA ABDITA	- --	*--	*+**	+	- *+ -
	TELLINA VERSICOLOR	- -	---	*--	-	-
	LISTRIELLA SP	-	-	*-		* -
	ARMANDIA AGILIS		-	-+-	-	- + *
6	HEMIPHOLIS ELONGATA	--- -	-- -	*		- -
	STHENELAIS BOA	+-	*-	-*		--
	ANCISTROSYLLIS JONESI	-- -	--*--	+		- -----
	VITRINELLA HELICOIDEA	-		+		-*+-+-
	ASYCHIS ELONGATA			+		**+ +*++
	NEMATODA	-	--	--	*	+ -
	MAGELONA ROSEA	*	*	* **		*
	CALLIANASSA ACANTHOCHIRUS	*	*	**		*
	ANCISTROSYLLIS HARTMANAE		*	+		+
	NEPHTYS BUCERA	*		**		* *

Symbols indicate intervals on a standardized scale of 0 to 1

= ≤ 0

• = 0-0.25

- = 0.25-0.50

+ = 0.50-0.75

* = ≥ 0.75

Table 27

Two-Way Table, March Benthic Data

SITES

Site groups (handwritten numbers above the columns): 1 = 2-3, 15-2, 15-3, 2-2, 15-5; 2 = 2-4, 2-5, 15-4; 3 = 14-5, 12-3; 4 = 15-1; 5 = 2-1; 6 = 12-1, 12-4, 27-3, 14-2, 14-1, 14-3, 14-4, 12-2, 27-4, 12-5, 27-5, 27-1, 27-2

SPECIES	Group	Sites 1	Sites 2	Sites 3	Sites 4	Sites 5	Sites 6
MAGELONA SP	1	+-+*-	+••	--	*	-	---•-•---+----
NEREIS SP	1	+•***	--	**	*	+	+---•--------+-
LUMBRINERIS TENUIS	1	+--++	+++	*+	-	•	--+++**+*--++
PRIONOSPIO PINNATA	1	**+•*	--+	+-	•	-	•••• ••••••
MEDIOMASTUS CALIFORNIENSIS	1	•**+•	•••	•+	-	•	•• •• • • •
NEMERTEA (YELLOW BANDED)	1	++*++	++-	-*	+	+	- - -
PHORONIS ARCHITECTA	1	•-*-		*+	+		••+•-
SPIOPHANES BOMBYX	2	•	•	•*		•	••
NEMATODA	2			*			
TELLINA VERSICOLOR	3	-		**			-
EUCERAMUS PRAELONGUS	3			**			- -
ABRA AEQUALIS	3	-	-	*			-+
AMPHARETE ACUTIFRONS	3			*+			* --
AMPHARETE (EYES)	3	*		**			- - -
PAGURUS ANNULIPES	3	- -	-	**		*	-- -
NEPHTYS BUCERA	3			+*		-	-- - -
NOTOMASTUS LATERICEUS	3	+	+--	+*	-	-	-* +*+ -
NEMERTEA (WHITE)	3	- +	-	-*	+		-- --
COROPHIUM ACHERUSICUM	3		+	-+	*	•	-•
ANAITIDES ERYTHROPHYLLUS	3			-*	•	•	• •
GLYCERA AMERICANA	3	*--*+	+++	**		-	+--- + -*+-
AGLAOPHAMUS VERRILLI	3	- -+	-	**			- - -
AMPELISCA ABDITA	3	•	•-	*-			•-• ••-•--•
MAGELONA ROSEA	3	** *		**			* * ***
ARICIDEA SP	3	++		+			+ *
STYLOCHUS ELLIPTICUS	3	*		-			- -
PARANTHUS RAPIFORMIS	4	--*--			-		-
SPIOCHAETOPTERUS OCULATUS	4	+*+	+		*		* +
BUNODACTIS TEXENSIS	4	--*			+		- -
OWENIA FUSIFORMIS	4	* +			*		+ +
NASSARIUS ACUTUS	4	- -*	-		+		--
SIGAMBRA TENTACULATA	4	*---	---	+-	+		- -*-+--
OCYPODES LIMICOLA	4	+ -		+	*		-
NEREIS SUCCINEA	4	+		+	+		*+ ++
LEPIDONOTUS SUBLEVIS	4	+		*	+		*
GYPTIS VITTATA	4	*	+	+	+		+ +
HEMIPHOLIS ELONGATA	4	-			+		- *+--+*+
STHENELAIS BOA	4	+			+		*+++ *
POLYDORA SOCIALIS	4	*					* + + +
CEREBRATULUS LACTEUS	5	*- -+	+*+	+		-	*++-----*****
PINNIXA CRISTATA	5	-- +-	---	--			+-+*++++--+-
DIOPATRA CUPREA	5	+•---	*--	*	+		+-*-••*++ +*+
GLYCINDE SOLITARIA	5	++--*	+-+	-			--••--•-•-• -
SIGAMBRA BASSI	5	-- -	* -	+-			-+- -+-+- ++
BALANOGLOSSUS	5	••--•	-				-•• -••--* ••
NINOE NIGRIPES	5	- +	+	-			++-*++++** --
ASYCHIS ELONGATA	5	-		-			---* --+-*---
CLYMENELLA ZONALIS	5	*	-	-	+		**- -*- *- +
ARMANDIA AGILIS	5	-					** -*+- **-
PHOTIS SP.	5			*			- * +-
MICROPHOLIS ATRA	6	- --		-			*+-
AMPITHOE SP	6	+		*			+ -
BATEA CATHARINENSIS	6	+		*			+ ++
VITRINELLA HELICOIDEA	6			+			* **
PSEUDEURYTHOE AMBIGUA	7	++-+*	•-				
NEMERTEA (YELLOW & PURPLE)	7	++* -	-+				-
ANCISTROSYLLIS JONESI	7	-+-	*+-	-			++- -- --
NUCULANA CONCENTRICA	7	--	- -				* - ---* -*
NATICA PUSILLA	7	*	+				+ *+
COSSURA DELTA	7	*	*+-				- - - - -
LEPIDASTHENIA SP	7		*				+ ++++ *

Symbols indicate intervals on a standardized scale of 0 to 1

= ≤ 0

• = 0-0.25

- = 0.25-0.50

+ = 0.50-0.75

* = ≥ 0.75

Table 28

Two-Way Table, May Benthic Data

SITES

SPECIES	Species group	Site group 1 (15-3, 15-4, 15-5, 2-1, 15-2, 2-3)	Site group 2 (2-2, 2-5, 2-4, 14-4, 15-1)	Site group 3 (14-5, 12-1, 12-3, 12-2, 12-5, 14-1, 14-2)	Site group 4 (12-3, 12-4)	Site group 5 (27-2, 27-5, 27-3, 27-1, 27-4)
NEMERTEA (YELLOW BANDED)	1	* * * + * *	+ * * - -	+ * * + + * -	+ +	-
GLYCERA AMERICANA	1	* + * - + *	- - * - +	• + * - * - -	- +	- - •
NEREIS SP	1	• + * + - +	- - - - -	- + - + - + •	+ +	- • - - -
PRIONOSPIO PINNATA	1	• - - - • -	* + * + -	- - - + - - -	• •	- - •
GLYCINDE SOLITARIA	1	- + - - + *	* * - -	- - - + - - -	•	- + - •
LUMBRINERIS TENUIS	1	+ • • -	- - - - -	* * * + * * *	+ -	+ + - - -
CEREBRATULUS LACTEUS	1	* + + - -	- + - + -	* * * * + + +	* -	* • - + +
MAGELONA SP	1	+ + + - - -	+ * + - *	- + - * * • +	- •	+ + - - -
BALANOGLOSSUS	1	• • -	- * •	+ + - • * • *	- •	- • - •
PINNIXA CRISTATA	1	- • •	• •	* + + - - -	• •	- •
NINOE NIGRIPES	2		+ -	* * * * + *		+ + - -
CLYMENELLA ZONALIS	2	- +	-	- + + * - -		- - -
COSSURA DELTA	2	* * *	* *	* - * + *		+ + - -
ANCISTROSYLLIS JONESI	2	+ +	- -	- -	-	* - *
ASYCHIS ELONGATA	2			* - + -	-	- - - *
MAGELONA ROSEA	2	- -	-	- - *	-	- - -
GYPTIS VITTATA	2	- - -	- -	- - -	*	- - -
SIGAMBRA TENTACULATA	2	- - - +	+ + * - -	- - + -	- -	- * + - -
DIOPATRA CUPREA	2	- - *	+ + - *	+ - - - - -	-	+ - + + -
SIGAMBRA WASSI	2	+	- • +	- • * * •	+	* + + - -
PHOTIS SP.	2		-	+ - - + +	+	* - -
NEREIS SUCCINEA	3	- • + • •	• -	• + • - *	* *	
ABRA AEQUALIS	3	- - - • -	• - -	- • • *	* *	•
PAGURUS ANNULIPES	3	• • - • •	• • •	+	* *	•
PRIONOSPIO CIRRIFERA	3	+ * •	- • -	• + - -	* +	- -
POLYGORDIUS SP.	3				* *	
AMPITHOE SP	3		-	-	+ *	-
STYLOCHUS ELLIPTICUS	3	-	- - -	- - -	* *	
PSEUDEURYTHOE AMBIGUA	3	-	- -	+ +	- *	- -
GIANT SPERM	4		-	+ *	+	
LEPIDONOTUS SUBLEVIS	4	+		+ - *	+	
NEMATODA	4	- - -	-	- *	*	
ARMANDIA AGILIS	4			*		+ *
ANADARA TRANSVERSA	4	+ +	+	+	* *	
ARICIDEA SP	4		*	* * *	* *	*
POLYDORA SOCIALIS	4		-	+ -	+ -	-
PISTA CRISTATA	4			+ * +	* +	
OWENIA FUSIFORMIS	4	+ + *	+ + +	+ *	*	
AMPHARETE (EYES)	4	*	+ +	+ *	+	
SPIOCHAETOPTERUS OCULATUS	4	*	+ + +		+	
ALBUNEA PARETII	4		*			
NOTOMASTUS LATERICEUS	5	- + + - +	* - +	+ - + - + +	-	
MICROPHOLIS ATRA	5	-	*	- - - - - +		
AGLAOPHAMUS VERRILLI	5	- - -	-	- * *		-
LEPIDASTHENIA SP	5	- -	-	+ - + * *	- -	-
STHENELAIS BOA	5	+	+	* * * * +	+	+
AMPHARETE ACUTIFRONS	5			* - +	*	
PHORONIS ARCHITECTA	5	- + -	• •	* + -		•
CIRRATULUS HEDGPETHI	5	-	+	* *		+ -
NUCULANA CONCENTRICA	5		- - -	- - * *		-
CLYMENELLA TORQUATA CALIDA	5			* - +		
EASCANICHTHYS TERES	5			* * *		* *
PRIONOSPIO DAYI	6	- * + -		•		
MAGELONA RIOJAI	6	* *				
SPIOPHANES BOMBYX	6	+ • • * + -	- -	-	- -	
NEPHTYS BUCERA	6	* +	-	- - *	* -	
MEDIOMASTUS CALIFORNIENSIS	6	+ * * - + -	• - - +	• • - • •	• •	
OXYUROSTYLIS SALINOI	6	+ + * * + *	* * - -	- -		
AMPELISCA ABDITA	6	+ + + - - -	- •	- + - + *	- •	- - -
COROPHIUM ACHERUSICUM	6	+ - * • - -	- - -	• • • - -	• •	• -
HEMIPHOLIS ELONGATA	6	* * * - -	+ -	+	+	+ - -
TELLINA VERSICOLOR	6	* + * *	+	+ + + +	+	
SCOLELEPSIS SQUAMATA	6	- * * -			-	-
THARYX SETIGERA	6	+ * *		-	+ *	-
NEMERTEA (WHITE)	6	- + *		* * - - -	+ - -	
ANAITIDES ERYTHROPHYLLUS	6	+ + -		*	- * *	
NEMERTEA (YELLOW & PURPLE)	7	* + * + +	+			
BATEA CARTHAPINENSIS	7	* * +		+		
SPIOCARCINUS LOBATUS	7	* *	* +			+
NATICA PUSILLA	7	* + -	-			•
SOLEN VIRIDIS	7	* + *		+		
PARANTHUS RAPIFORMIS	7	+ * + *	+	+		

Symbols indicate intervals on a standardized scale of 0 to 1

- (blank) = ≤ 0
- • = 0-0.25
- - = 0.25-0.50
- + = 0.50-0.75
- * = ≥ 0.75

Table 29

Number of Individuals of Benthic Macroinvertebrates Collected In Each Trawl During the Experimental Study

Trawl	July	Sept.	Nov.	Jan.	Mar.	May
2-1	71	17	2	2		2
2-2	102		2	4		2
2-3	70		3	2	5	
15-1	32	7	1		1	
15-2	42	6				
15-3	25	4	1		1	1
12-1	32		9	12	5	
12-2	10		8	2		3
12-3	122	7	6	3	2	2
14-1	28			9	3	7
14-2	28		1	2		9
14-3	20	5			4	13
27-1	7	2		2		
27-2	33	4	1	1	2	1
27-3	13	3	9	1		

Table 30

F Values and Significance (5% level) of the Variance Between Populations Of Each Nektonic Component Within Each Block in the Dredged Material Disposal Site

	Blocks				
	2	15	12	14	27
F(Macrobenthic	0.03	0.06	0.75	0.02	0.60
Significance	NS	NS	NS	NS	NS
F(Nektonic Invertebrates)	0.06	1.09	1.64	1.23	1.18
Significance	NS	NS	NS	NS	NS
F(Fish)	0.23	2.50	0.55	0.25	0.18
Significance	NS	NS	NS	NS	NS
F(Total Population)	0.05	5.75	0.67	0.65	0.53
Significance	NS	S	NS	NS	NS
F(Biomass)	0.42	3.34	0.84	0.17	0.04
Significance	NS	NS	NS	NS	NS

AD-A061 844 ARMY ENGINEER WATERWAYS EXPERIMENT STATION VICKSBURG MISS F/G 13/3
AQUATIC DISPOSAL FIELD INVESTIGATIONS GALVESTON, TEXAS, OFFSHOR--ETC(U)
MAY 78 T D WRIGHT, D B MATHIS, J M BRANNON

UNCLASSIFIED WES-TR-D-77-20 NL

4 OF 10
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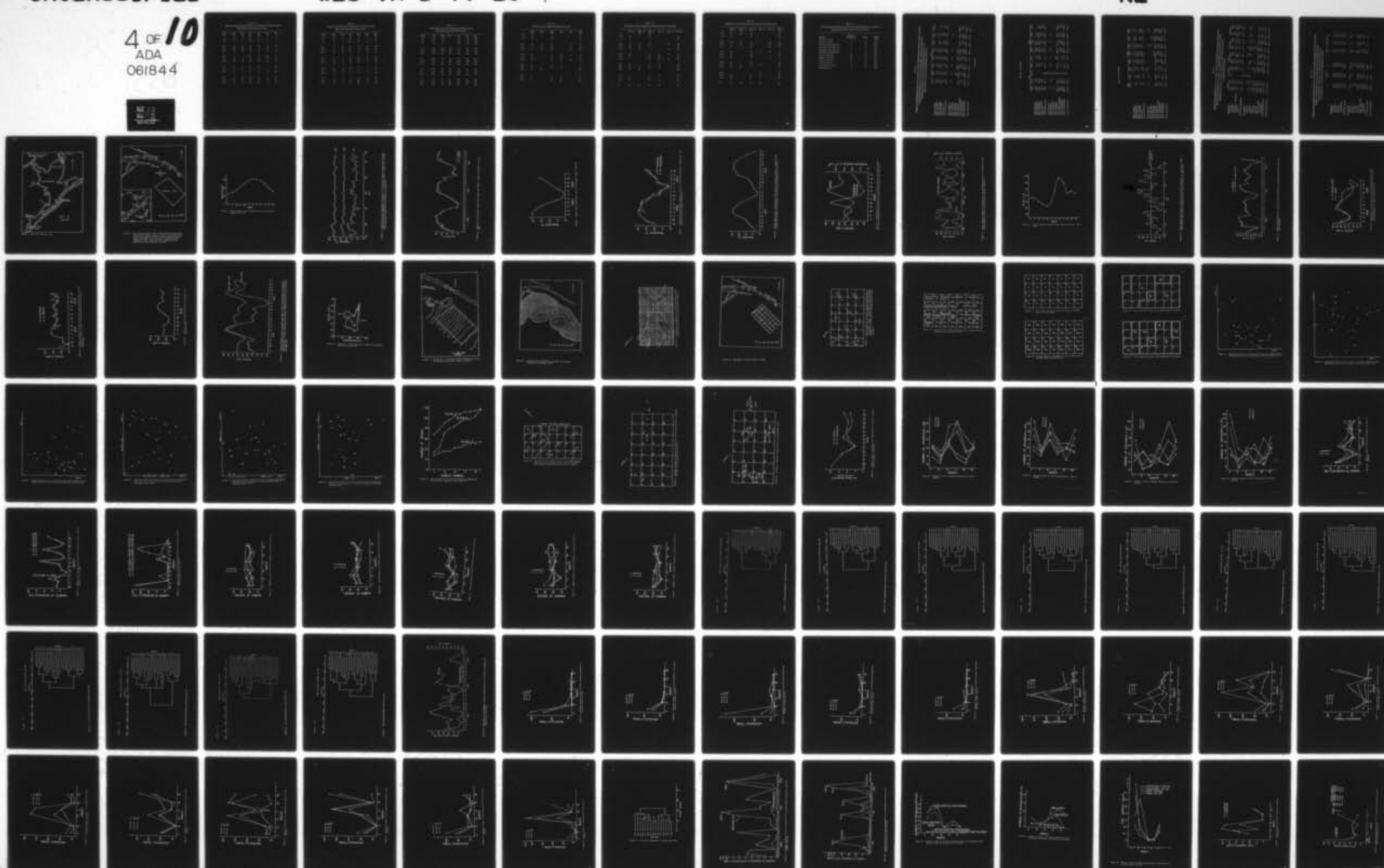


Table 31

Number of Individuals of Nektonic Invertebrates Collected in Each Trawl During the Experimental Study

Trawl	July	Sept.	Nov.	Jan.	Mar.	May
2-1	62	30	110	18	3	4
2-2	45	13	158	49	7	11
2-3	24	11	177	27	41	4
15-1	66	53	85	44	20	23
15-2	64	132	28	19	32	7
15-3	19	40	10	39	31	10
12-1	25	8	187	72	134	13
12-2	33	3	40	33	29	10
12-3	58	21	88	65	83	13
14-1	57	3	55	76	4	139
14-2	42	13	32	41	4	2
14-3	20	5	10	13	9	110
27-1	7	11	43	57	3	15
27-2	39	19	85	56	20	21
27-3	19	6	174	154	8	33

Table 32

Numbers of Individuals of Vertebrates Collected in Each Trawl During the Experimental Study

Trawl	July	Sept.	Nov.	Jan.	Mar.	May
2-1	59	6	61	19	22	140
2-2	52	5	69	26	9	95
2-3	51	3	108	46	60	82
15-1	35	22	178	24	176	150
15-2	32	36	131	74	164	76
15-3	23	13	48	55	15	30
12-1	71	2	53	158	18	137
12-2	38	2	33	169	26	176
12-3	47	2	64	103	11	21
14-1	69	4	22	53	1	39
14-2	105	23	27	11	8	27
14-3	56	11	26	13	16	14
27-1	2	2	5	83	19	103
27-2	38	3	22	268	22	13
27-3	16	3	37	171	19	38

Table 33

Total Biomass of all Individuals Collected in Each Trawl During the Experimental Study

Trawl	July	Sept.	Nov.	Jan.	Mar.	May
2-1	2723	321		150	585	1538
2-2	2167	43		163	86	862
2-3	1531	102		136	335	834
15-1	1071	278	490	95	817	1384
15-2	1018	886	456	141	791	706
15-3	388	226	212	155	151	285
12-1	1487	92	915	367	629	1173
12-2	1331	72	604	1019	125	1761
12-3	891	166	562	424	316	343
14-1	1419	306	178	378	151	918
14-2	1788	441	397	199	95	194
14-3	1463	49	141	116	134	377
27-1	128	71	105	418	160	918
27-2	836	95	295	436	212	129
27-3	292	66	067	615	94	376

Table 34

Numbers of Fish Stomachs Examined Each Month

	July	Sept.	Nov.	Jan.	Mar.	May
2-1	10	5	10			10
2-2	10	5	10			10
2-3	10		10			10
15-1	10	10	10		10	10
15-2	9	10	10		10	10
15-3	10	10	10		10	10
12-1	10		9	10	10	10
12-2	10		10	10		10
12-3	10		10	10	10	10
14-1	10		4	6		9
14-2	10	10	10	6		10
14-3	10	10				10
27-1				9		10
27-2	10		10	10		5
27-3	5		10	10		10

Table 35

Percentage of Empty Stomachs of Fish Collected in Each Trawl

	July, %	Sept., %	Nov., %	Jan., %	Mar., %	May, %
2-1		20	30			
2-2	20		40			20
2-3	10		50			30
15-1	20	10	50		10	40
15-2	22	60	10			40
15-3	30	10			10	40
12-1	20		22	20	20	10
12-2	10		50	80		30
12-3			30	60	20	30
14-1	60		50	30		40
14-2	30	10	40	50		20
14-3	10	10				60
27-1				56		30
27-2	10		20			20
27-3	20		20	60		20
$\bar{X}$	19	17	32	45		29

Table 36

Percentage of Full Stomachs of Fish Collected in Each Trawl

	July, %	Sept., %	Nov., %	Jan., %	Mar., %	May, %
2-1	40	40	30			50
2-2	50	100	10			30
2-3	60		30			40
15-1	20	60	30		60	20
15-2	11	30	70		40	20
15-3	50	10	80		90	40
12-1	60		20	30	30	70
12-2	70		20			70
12-3	80		40		30	70
14-1	10		50			58
14-2	30	70	30	33		50
14-3	10	80				10
27-1				11		50
27-2	40		40	20		60
27-3	20		60	20		40
$\bar{X}$	39	55	39	14		45

Table 37

Food Species That Were Not Collected Concomitantly by Core from the Same Block in Which the Fish Were Collected

Species	Number of Individuals	Block	Month
Pinnixa cristata	1	2	July
Pinnixa cristata	6	27	Jan.
Anaitides erythrophyllus	1	12	July
Anaitides erythrophyllus	2	15	July
Anaitides erythrophyllus	1	2	Nov.
Anaitides erythrophyllus	1	27	May
Mulinia lateralis	27	14	Jan
Mulinia lateralis	10	2	May
Mulinia lateralis	15	27	May
Nereis succinea	2	27	Jan.
Notomastus hemipodus	1	15	Mar.
Armandia agilis	8	12	May

Table 38

Summary of the Zooplankton Data from the National Marine Fisheries Service Archival Samples Collected at Station W53 Between 11 March 1963 and 2 June 1965. Data are the Numbers of Individuals of Meroplanktonic and Holoplanktonic Groups per m^3 of Water Filtered and the Total Zooplankton Population

	1963							
	3/11	3/26	5/7	5/13	7/1	8/27	10/1	10/30
Total Cnidaria	144.6	3.6	3.9	13.6	0.2		6.3	
Total Polychaeta	11.5	8.0	39.1	0.3	8.2	1.8	3.2	
Total Mollusca	7.7	2.7	54.3	32.5	637.5	143.4	4.7	6.1
Total Cirripedia	199.7	72.0	11.7	44.7	0.2		4.8	
Total Crustacea	1.6	0.9	8.3	8.6	12.3	26.2	9.9	0.2
Total Misc.	1.6	8.1	1.1	0.9	10.5	43.0	3.7	0.8
Total Meroplankton	366.7	95.3	118.4	100.6	668.9	2.4.4	32.6	14.1
Total Protozoa	2.6							
Total Radiata	1.3	6.2	4.4	0.1	7.7		0.8	
Total Polychaeta								
Total Mollusca		0.9						
Total Cladocera		35.5	1260.6	0.3	28.1			
Total Copepoda	1529.8	4120.8	2312.2	251.0	2144.9	1216.4	629.1	6286.5
Total Other Crustacea	5.2	1.0	5.8	16.7	171.5	4.5	30.5	43.3
Total Chaetognatha	5.1	0.2	15.5	3.8	5.1	1.8	245.9	74.0
Total Urochordata	1.4	595.6	477.4	3.6	442.9	17.4	265.4	P
Total Holoplankton	1545.4	4760.2	4065.9	275.5	2800.2	1240.1	1171.7	6403.9
Total Zooplankton	1912.1	4855.5	4194.3	376.1	3469.1	1454.5	1204.3	6417.9

(continued)

Table 38 (continued)

	1964				1965				
	9/24	10/27	11/18	12/19	1/6	2/25	3/28	4/22	6/2
Total Cnidaria	6.9	44.1	FLOW METER DATA NOT RECORDED			57.0	42.9		
Total Polychaeta	64.5	8.4		0.1	0.6	28.6	177.7	0.6	
Total Mollusca	104.6	220.3		3.8	3.6	91.0	846.2	2659.5	47.1
Total Cirripedia	27.8	12.6		97.9	89.6	597.3	6094.2	123.2	63.4
Total Crustacea	84.2	13.4		0.2		18.7	1.8	6.5	13.1
Total Misc.	26.7	4.5				6.3	71.1	5.9	9.5
Total Meroplankton	316.8	301.2		102.0	93.8	798.9	7233.9	2794.9	133.1
Total Protozoa									
Total Radiata	6.4	6.5		0.4	P	0.3	0.1	4.7	
Total Polychaeta		0.1							
Total Mollusca	0.1								
Total Cladocera					0.3				
Total Copepoda	3921.1	3331.4		1668.4	334.9	4864.6	6407.8	763.3	1536.3
Total Other Crustacea	32.0	33.7				0.o	0.1	5.1	9.5
Total Chaetognatha	192.0	195.1		8.7	P	39.8	64.0	155.4	6.2
Total Urochordata	492.8	125.9			4.1	170.7	199.1	971.8	6.2
Total Holoplankton	4644.4	3692.7		1677.5	339.1	5075.5	6671.1	1901.3	1558.2
Total Zooplankton	4961.2	3993.9		1779.5	433.1	5874.4	13905.0	4695.6	1691.3

Table 38 (concluded)

	1963	1964						
	11/29	1/25	3/17	4/14	5/21	6/24	7/15	8/28
Total Cnidaria			157.7	77.3	0.2	8.9		2.5
Total Polychaeta	0.5	4.8	1.4	9.7	6.4	12.5	80.2	1.3
Total Mollusca	2.9	0.1	0.5	19.3	283.3	69.5	49.8	54.4
Total Cirripedia		15.8	80.4	222.2	217.9	35.6		
Total Crustacea	0.2	0.1		10.7	72.8	11.7	11.9	44.1
Total Misc.	1.3		0.4	24.1	438.4	8.9	3.5	15.8
Total Meroplankton	4.9	20.8	240.4	363.3	1019.0	147.1	145.4	118.1
Total Protozoa			713.6					
Total Radiata	0.1	0.4	0.1			3.7		2.7
Total Polychaeta						0.2		0.1
Total Mollusca						1.8	0.2	
Total Cladocera					21.8		10.7	
Total Copepoda	158.3	1066.8	162.7	5770.0	14007.7	2064.7	1696.4	592.6
Total Other Crustacea	0.2	0.1	0.2	9.8	130.8	76.5	78.2	56.1
Total Chaetognatha	17.7	0.1	0.9	9.7	43.6	312.9	10.7	18.1
Total Urochordata	1.3		1.4	4.8	347.8	17.8	807.1	231.8
Total Holoplankton	177.6	1067.3	878.9	5794.3	14551.7	2477.6	2603.3	901.4
Total Zooplankton	182.5	1088.2	1119.3	6157.6	15570.1	2624.7	2748.7	1019.5

Table 39

Summary of the Zooplankton Data Collected Monthly in the Ship Channel and in the Disposal Area from 24 July Through 24 November 1975. All Data are Numbers of Individuals of Major Taxonomic Groups per m^3 of Water Filtered. C - Ship Channel Collection; D--Disposal Area Collection

	7/24/75		8/29/75		9/27/75		10/27/75		11/24/75	
	D	C	D	C	D	C	D	C	D	C
MEROPLANKTON										
Cnidaria	25.1	25.0	SAMPLE LOST	372.7	174.6	58.8	4.2	4.0	2.4	6.4
Polychaeta	13.8	87.5		27.6	14.9	6.3	6.7	7.6	9.8	11.3
Mollusca	27.8	218.5		43.6	93.7	147.7	153.5	309.2	245.2	118.4
Barnacles - Cirripedia	17.0	15.1		28.1	13.1	205.1	3.5	5.8	173.3	590.3
Crustacea	36.1	51.6		59.6	90.4	134.8	45.7	284.2	2.6	21.4
Misc.		22.7			2.5				2.7	4.1
TOTAL MEROPLANKTON/m^2	119.8	420.4		531.6	389.2	552.7	213.6	610.8	436.0	751.9
HOLOPLANKTON										
Protozoa		12.8				43.3	9.4			
Radiata	6.9	4.6		0.5	140.9	9.6	12.2	2.4	379.9	208.8
Polychaeta	1.3	0.4			0.5	0.1	18.5	3.9	0.6	0.3
Mollusca	0.9	3.1		0.5			0.9	0.4		
Cladocera	3977.5	5039.0		1467.7	0.1		3.2			
Ostracoda	3.7	13.1		0.2			0.3			
Copepoda	2580.9	4030.8		8794.8	1117.9	1596.6	3041.8	4371.1	1751.3	1969.3
Other Crustacea	64.8	43.3		287.8	29.3	102.7	48.1	30.2	8.3	5.3
Chaethognatha	140.4	277.5		92.7	1056.8	529.4	499.3	613.3	350.9	219.0
Urochordata	335.8	460.6		1295.6	51.6	9.9		10.1		4.1
TOTAL HOLOPLANKTON/m^2	7112.2	9885.2		11939.8	2397.1	2291.6	3633.7	5031.4	2491.0	2406.8
TOTAL ZOOPLANKTON/m^2	7232.0	10305.6		12471.4	2786.3	2844.3	3847.3	5642.2	2927.0	3158.7

Table 40

Summary of the Zooplankton Data Collected on 9 October 1975 During the Texas City Channel Material Disposal. All Data are Numbers of Individuals per m^3 of Water Filtered.

T1 - Predisposal Collection; T2 - Collection in the Mud Plume;

T3 - Post-Disposal Collection After Dissipation of Plume

	# ind./m^3			% of total population		
	T1	T2	T3	T1	T2	T3
MEROPLANKTON						
Cnidaria	18.8	110.6	86.2	0.3	0.8	0.3
Polychaeta	213.3	183.0	392.4	0.7	1.4	1.4
Mollusca	677.4	249.4	125.0	2.3	1.8	0.4
Barnacles	176.8	19.8	126.3	0.6	0.2	0.4
Crustacea	83.7	122.8	33.8	0.3	0.9	0.1
Echinodermata	294.6	38.0	126.4	1.0	0.3	0.4
Misc.	62.7	44.5	221.1	0.2	0.3	0.8
Total Meroplankton	1584.8	768.1	1111.2	5.4	5.7	3.9
HOLOPLANKTON						
Protozoa	6804.8	4693.0	11400.0	23.1	34.7	40.2
Radiata	19.4	6.6	112.3	0.1	+	0.4
Polychaeta	1.2		1.4	+		
Mollusca	0.6		0.7	+		+
Cladocera	59.0	57.0	126.3	0.2	0.4	0.4
Copepoda	13904.8	6786.2	10169.1	47.2	50.2	35.9
Other Crustaceans	16.1	36.0	23.2	0.1	0.3	0.1
Chaetognatha	2036.3	990.5	1870.3	6.9	7.3	6.6
Urochordata	4948.8	190.0	3536.9	16.8	1.4	12.5
Misc.	59.0			0.2		
Total Holoplankton	27850.0	12759.3	27240.2	94.6	94.3	96.1
Total Zooplankton	29437.3	13527.4	28351.4			

Fig 1.

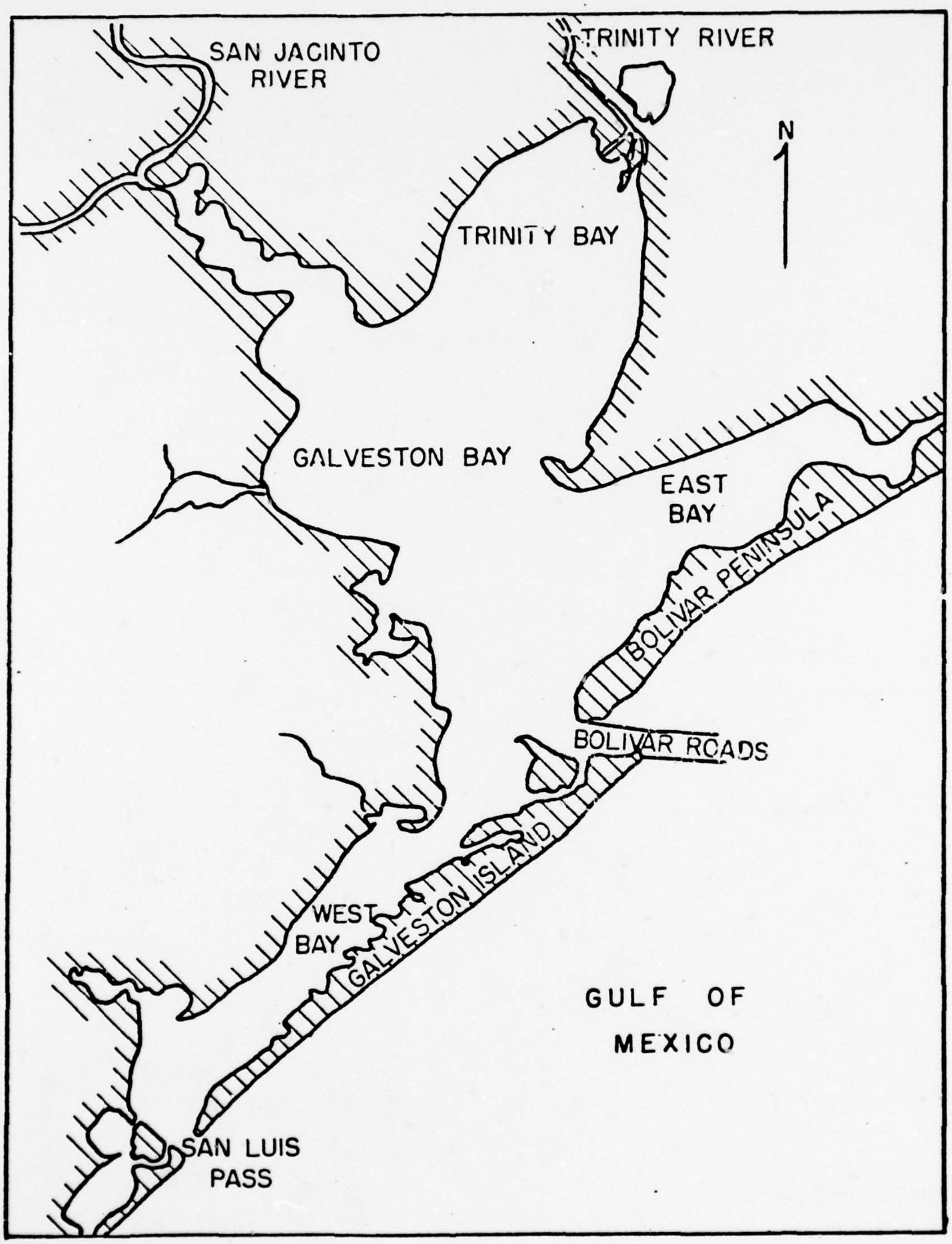


Figure 1. Map of the Galveston area.

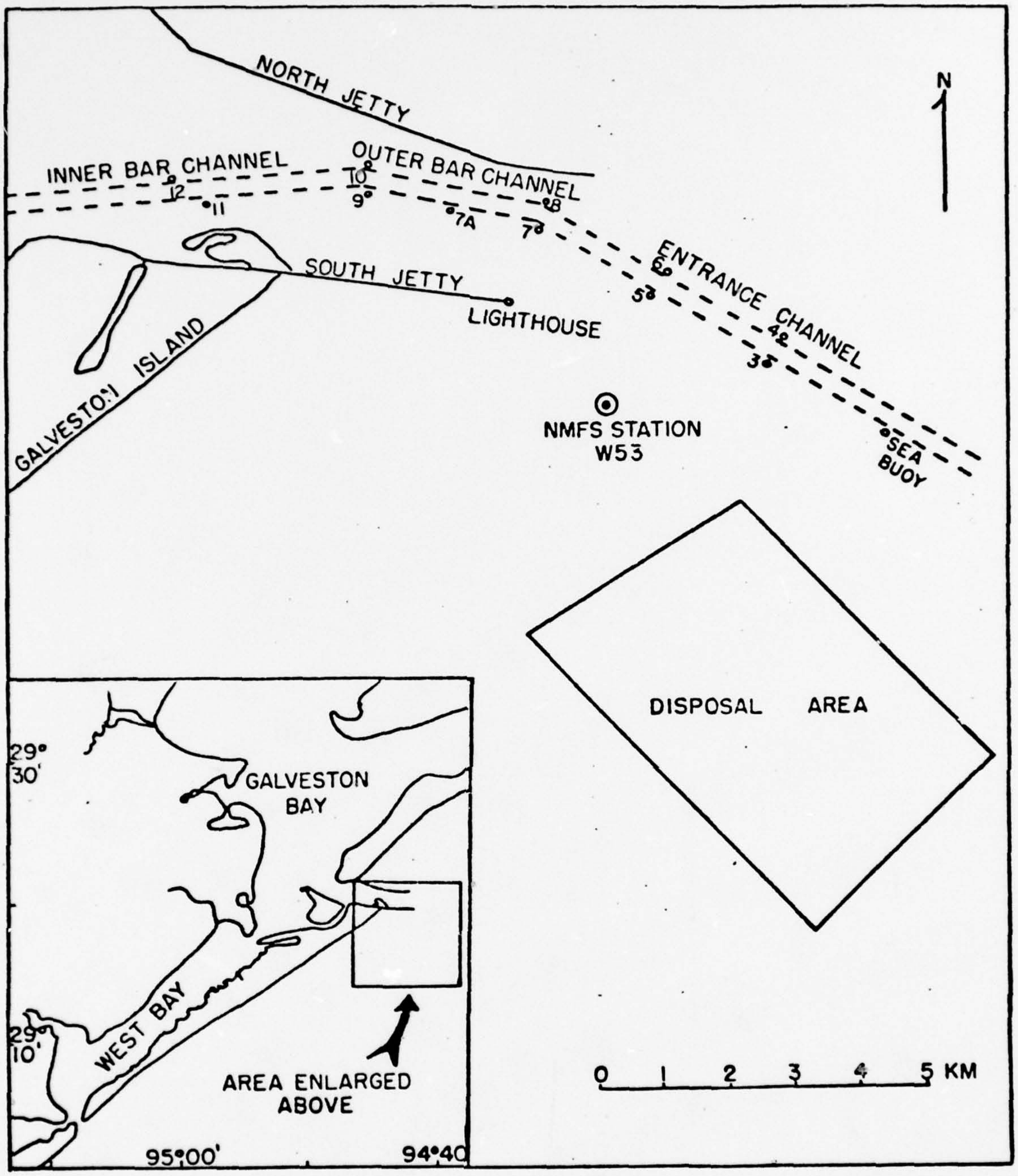


Figure 2. Map of the Galveston, Texas, area showing the location of the offshore disposal site in relation to the south jetty and the ship channel; numbered circles represent channel buoys; also shown is the location of National Marine Fisheries Service station W53 where hydrographic and plankton data were collected, 1963-1965

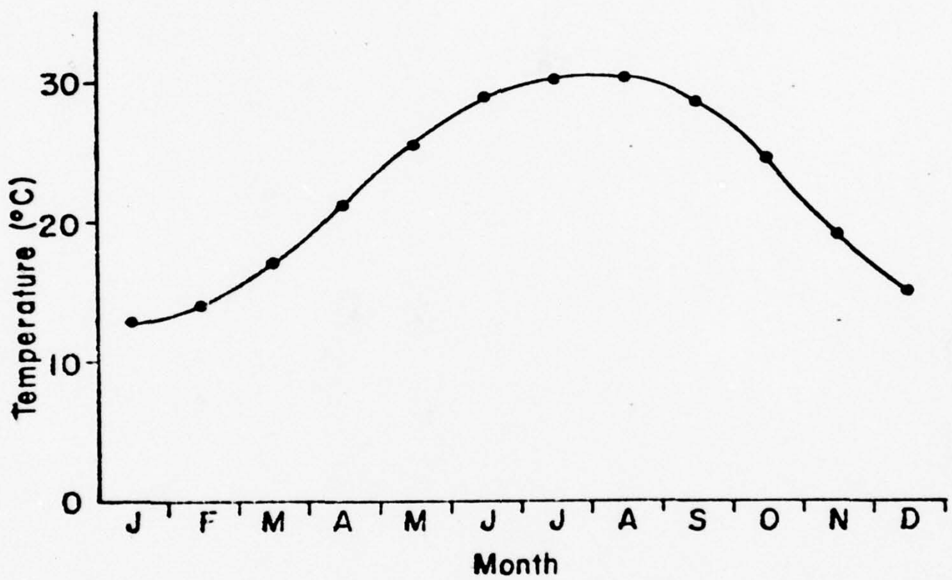


Figure 3. Average monthly water temperatures in the Galveston Channel, 1922-1975

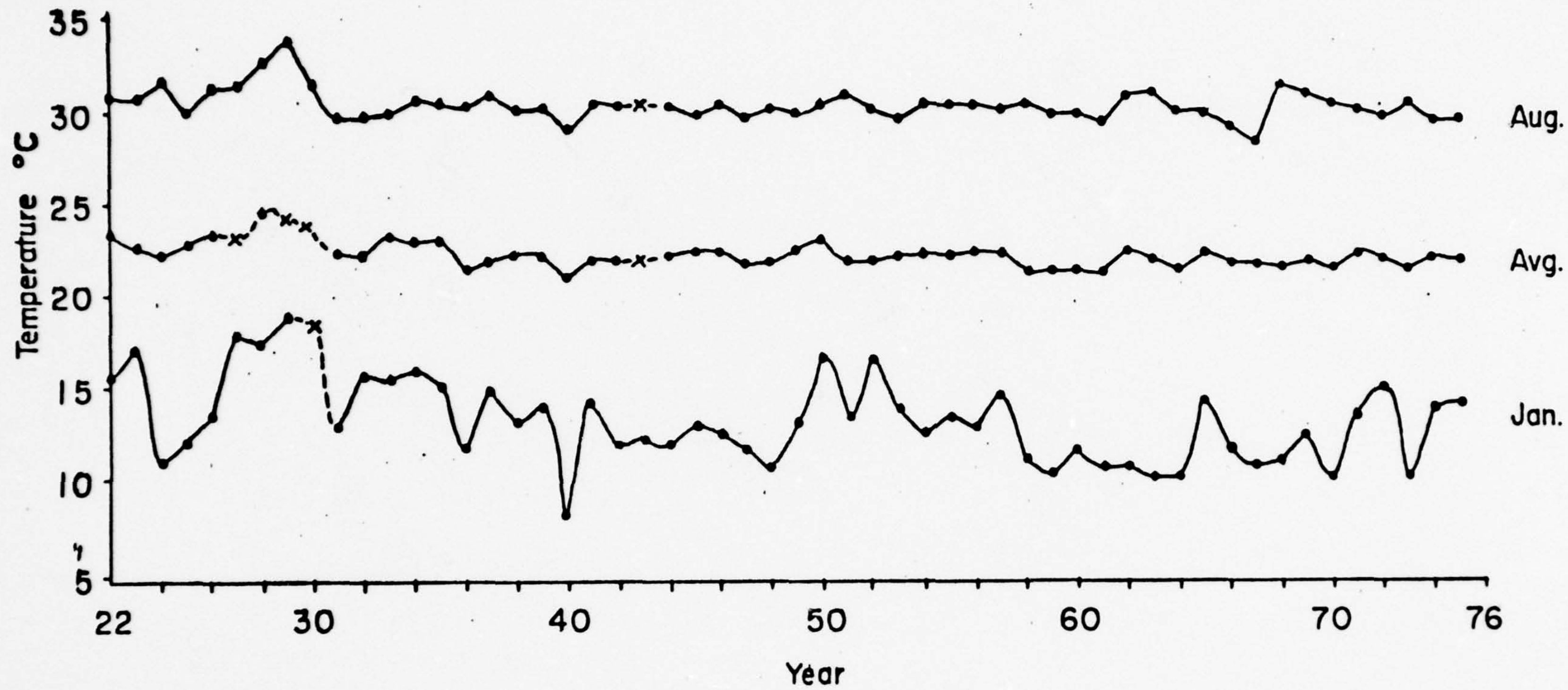


Figure 4. Average annual water temperature recorded in the Galveston Channel compared with averaged August and January temperatures, 1922-1975. x - data point based on fewer than 10 months' data; suggested temperature trend indicated by dashed line

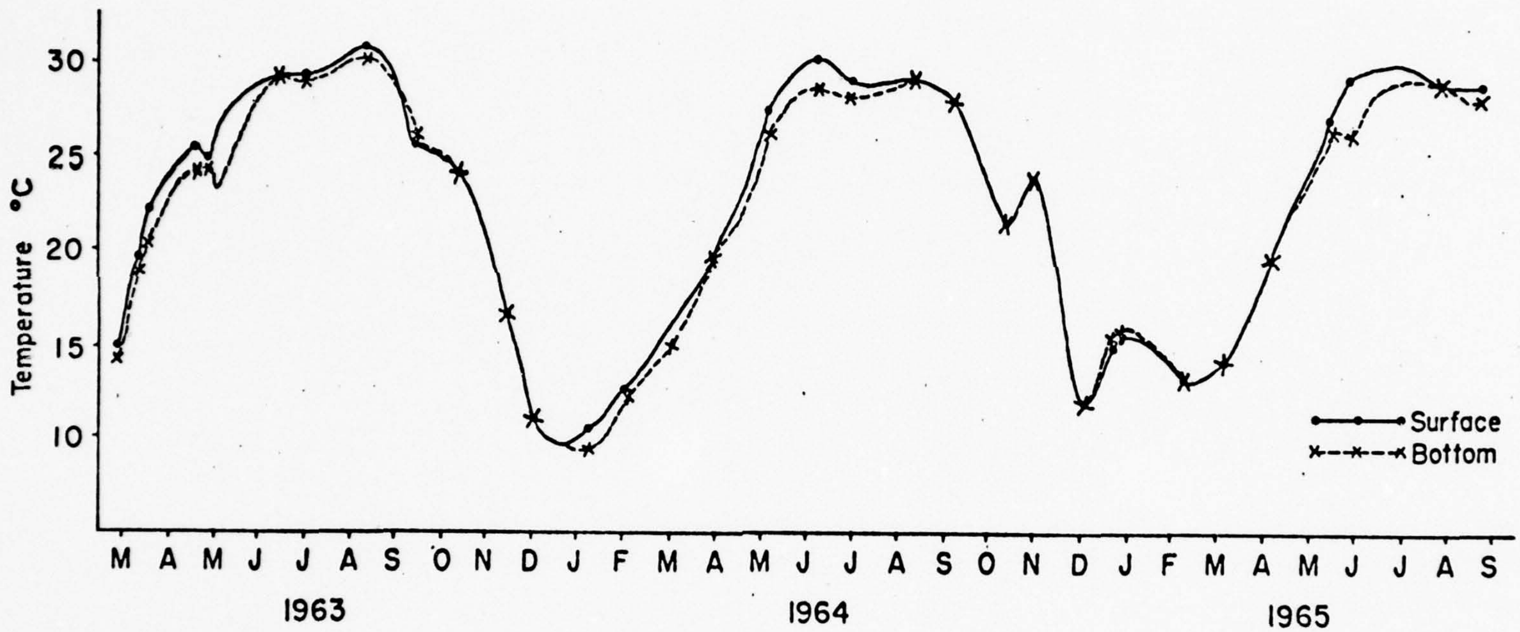


Figure 5. Surface and bottom water temperature trends, 1963-1965, at NMFS station W53, near the DMDS

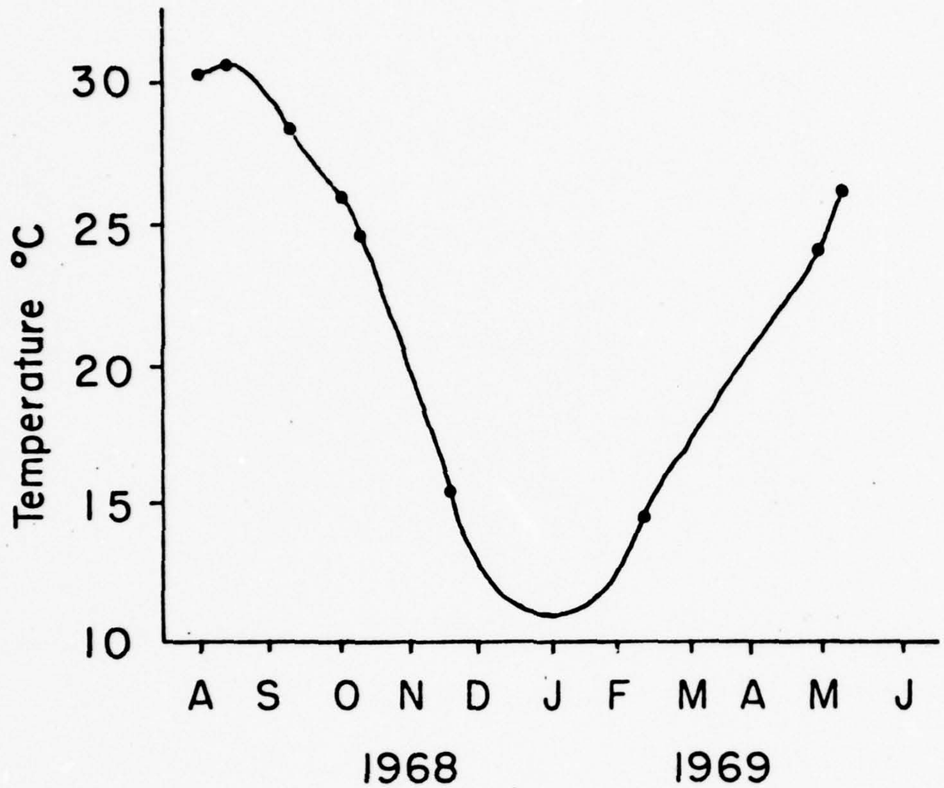


Figure 6. Surface water temperature trends off Galveston Island, 1968-1969

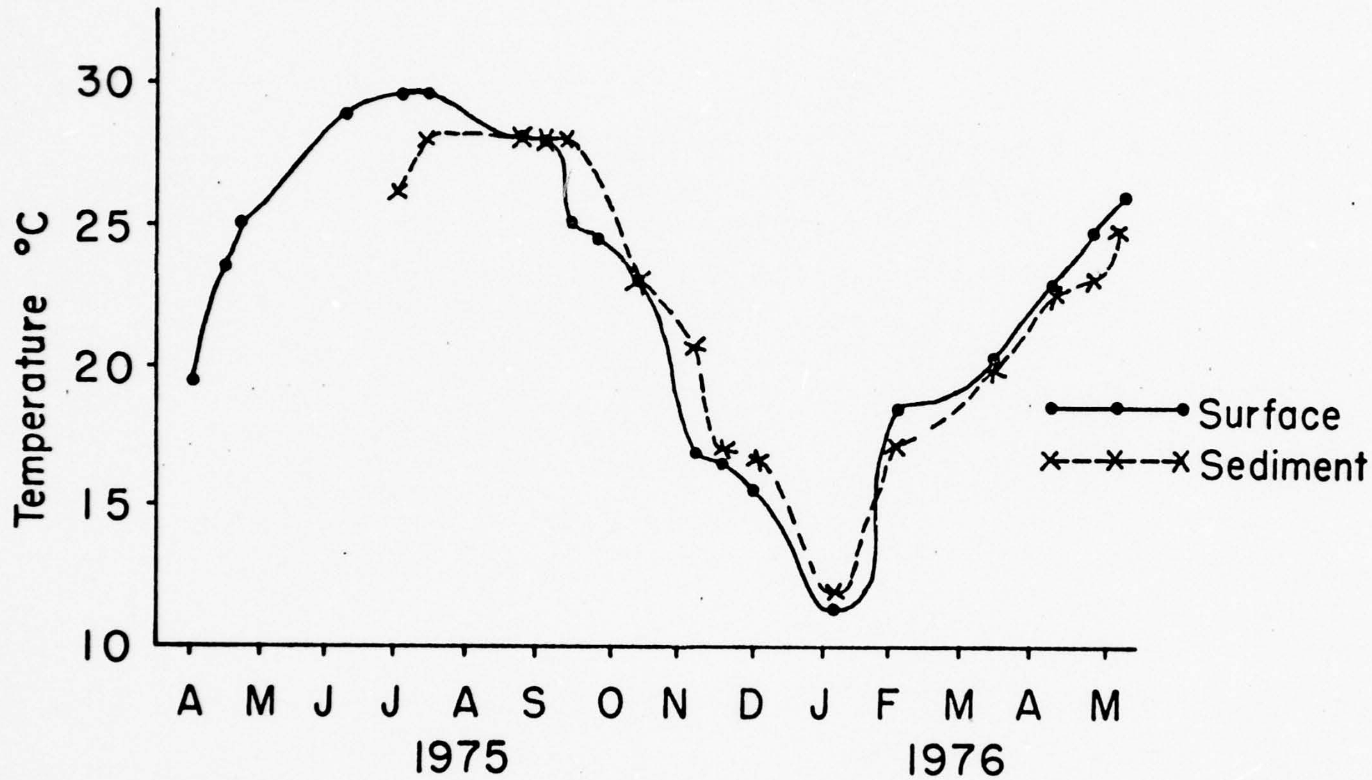


Figure 7. Surface water and sediment temperature trends in the dredged material disposal site and vicinity, Galveston, April 1975-May 1976.

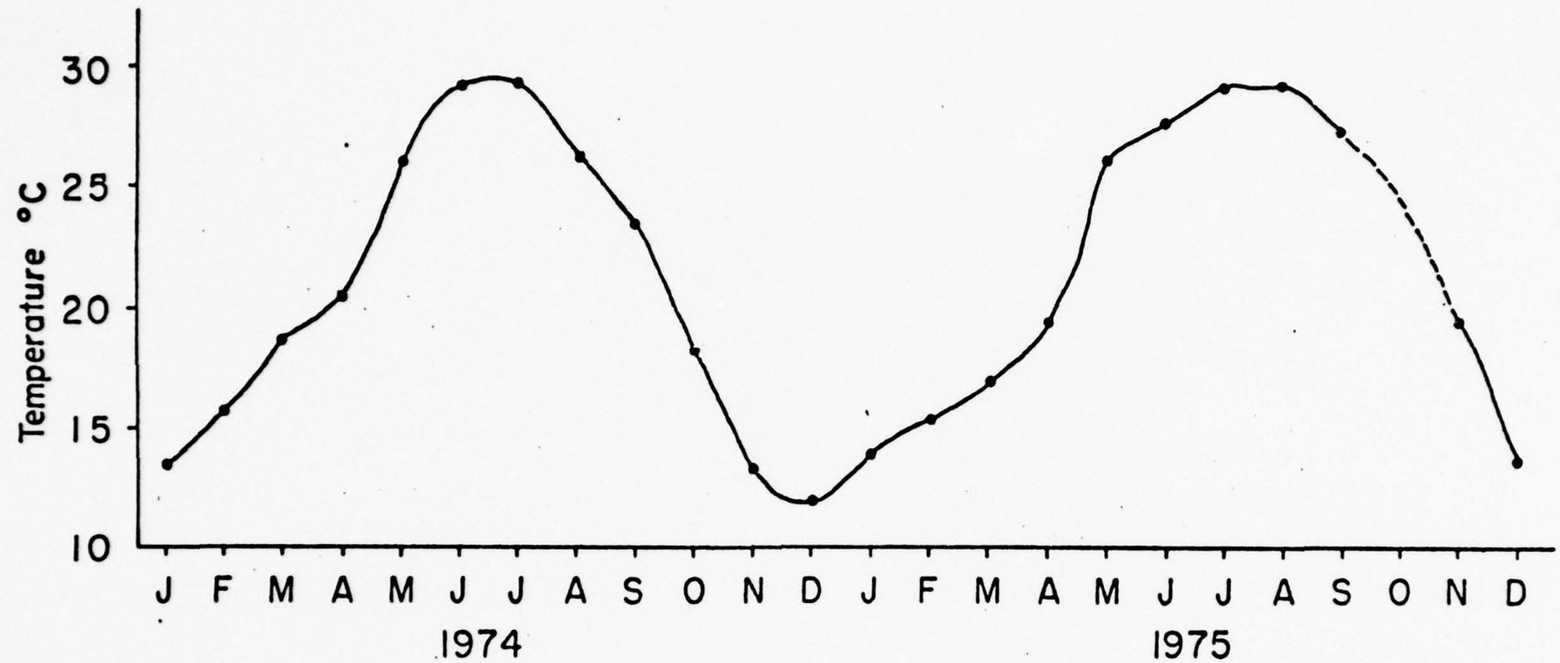


Figure 8. Average monthly water temperatures in the Galveston Channel, 1974-1975. September and October data missing, 1975; probable temperature trend indicated by broken line

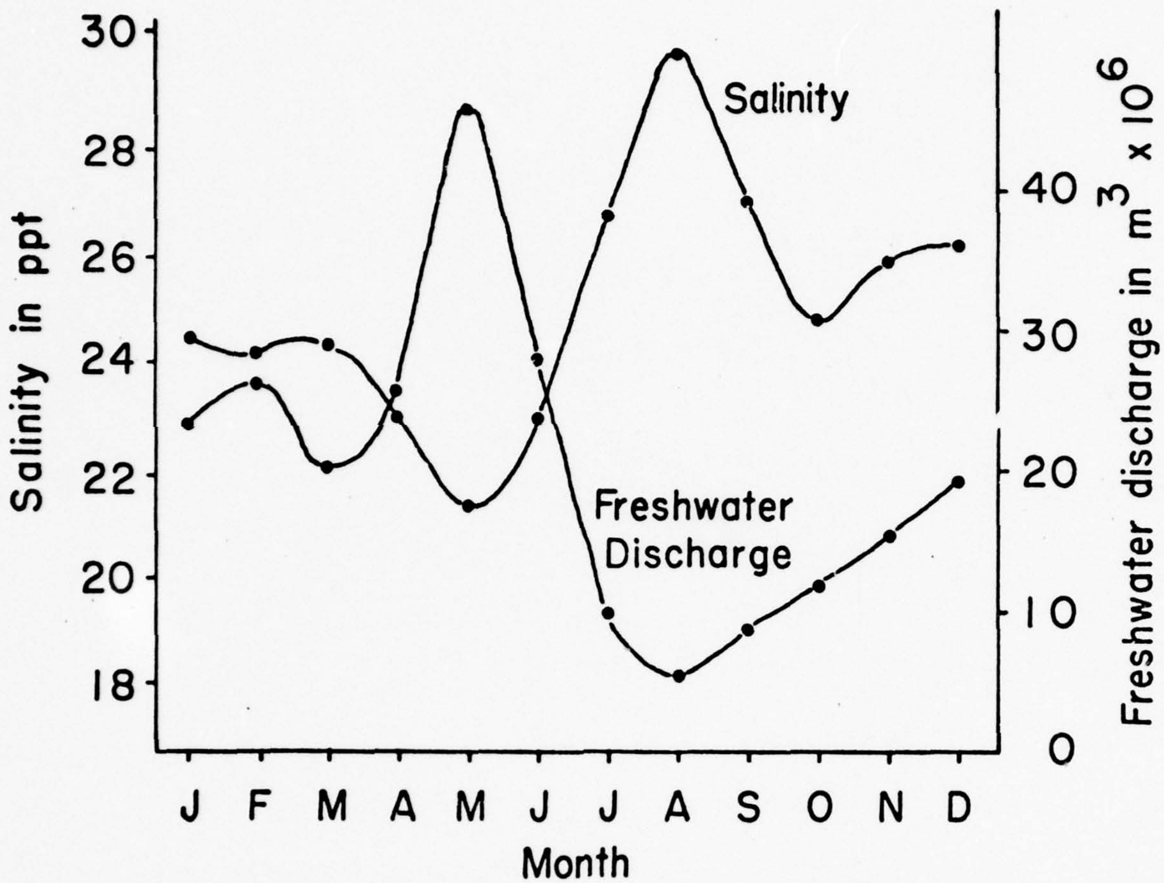


Figure 9. Average monthly salinity in the Galveston Channel (1950-1975) compared with the average monthly freshwater discharge into Galveston Bay (1950-1975)

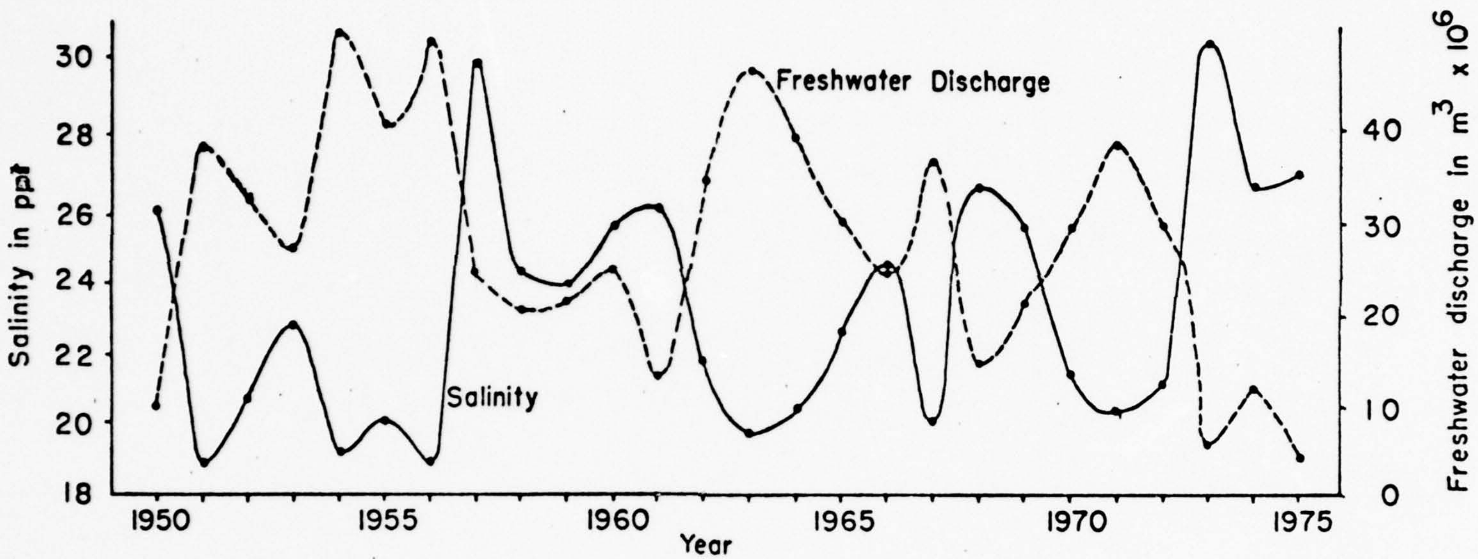


Figure 10. Annual average freshwater discharge into the Galveston Bay system, compared with the annual average salinity in the Galveston Channel (1950-1975)

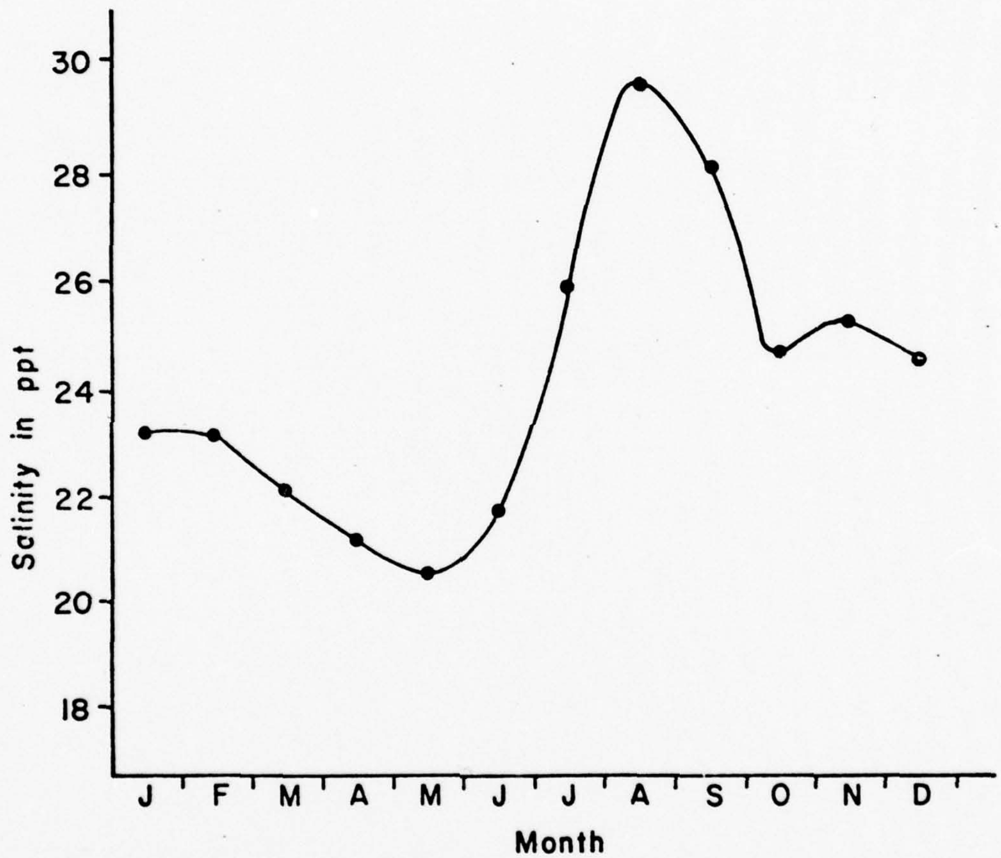


Figure 11. Average monthly salinity in the Galveston Channel, 1922-1975

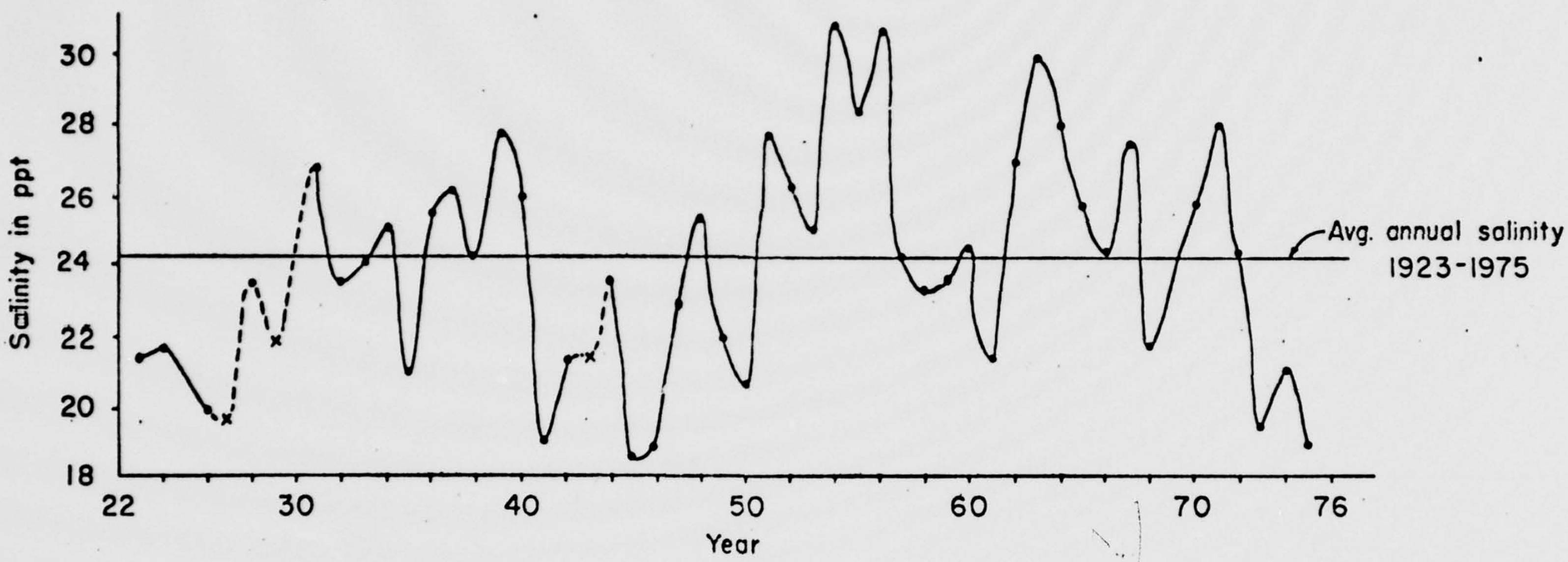


Figure 12. Annual average salinities in the Galveston Channel, 1922-1975. x - data point based on fewer than 10 months' data; suggested salinity trend indicated by dashed line

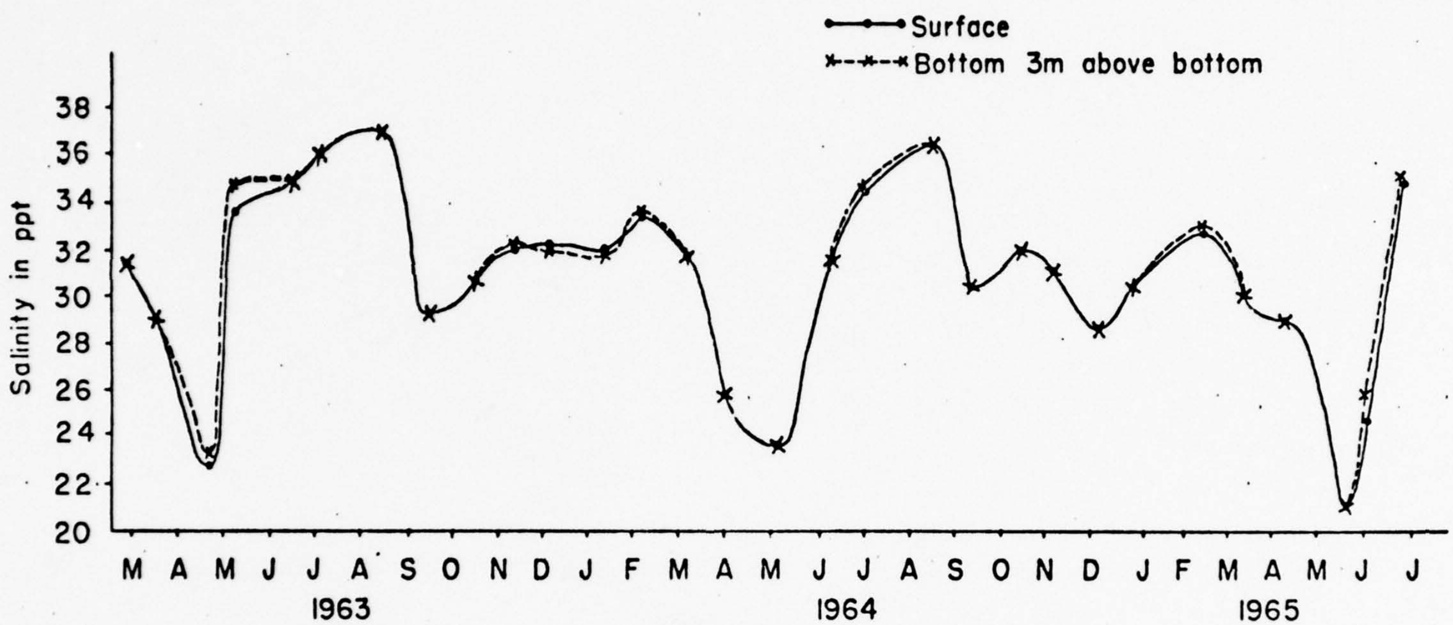


Figure 13. Surface and bottom water salinity trends, 1963-1965, at NMFS station W55 off San Luis Pass, Galveston

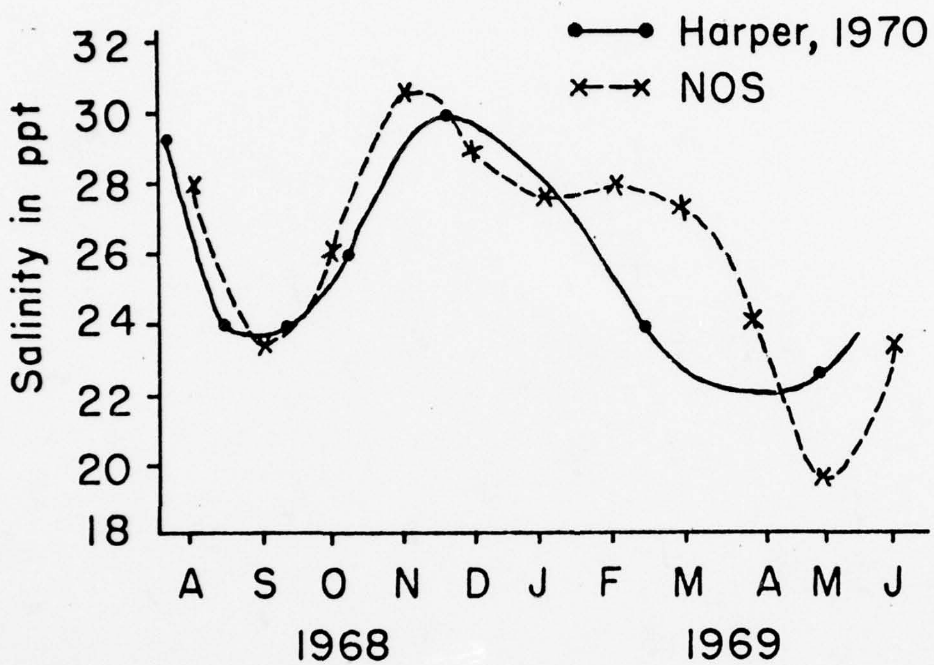


Figure 14. Comparison of surface salinity data collected by Harper (1970) and surface salinity data collected by National Ocean Survey at the Flagship Pier, August 1968-June 1969

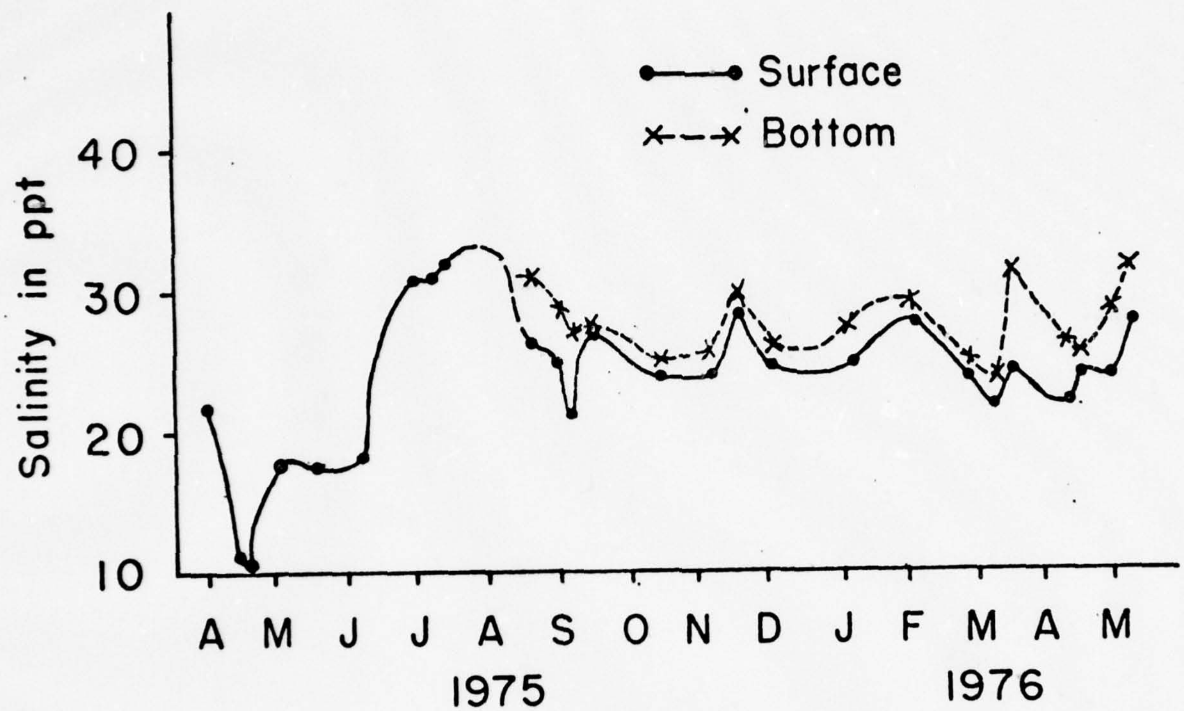


Figure 15. Salinity trends in the DMDS and vicinity, April 1975-May 1976. No data collected in August; possible surface salinity trend indicated by dashed line

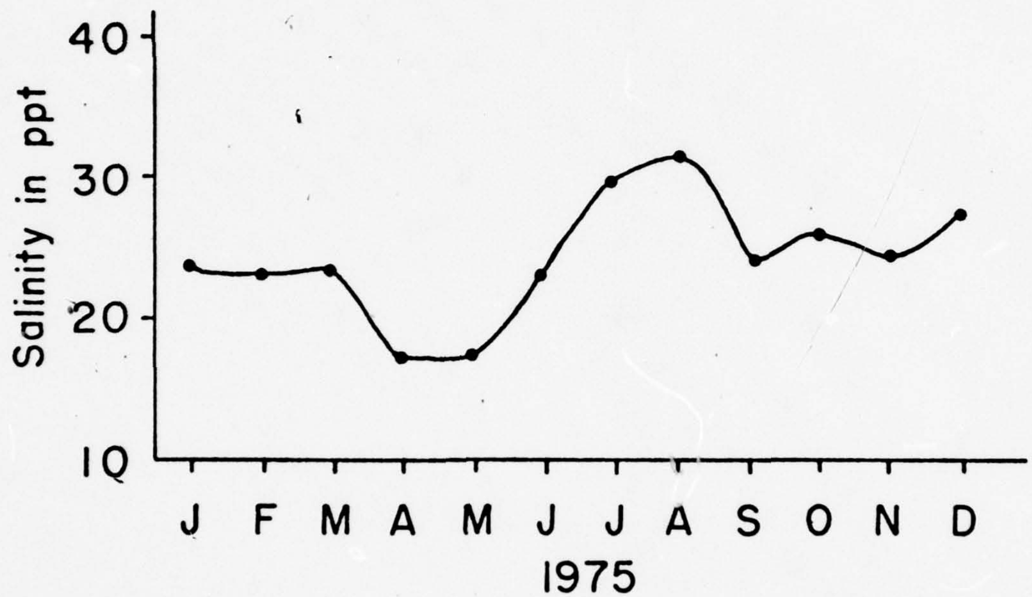


Figure 16. Surface salinity trends recorded at the Flagship Pier, Galveston, 1975

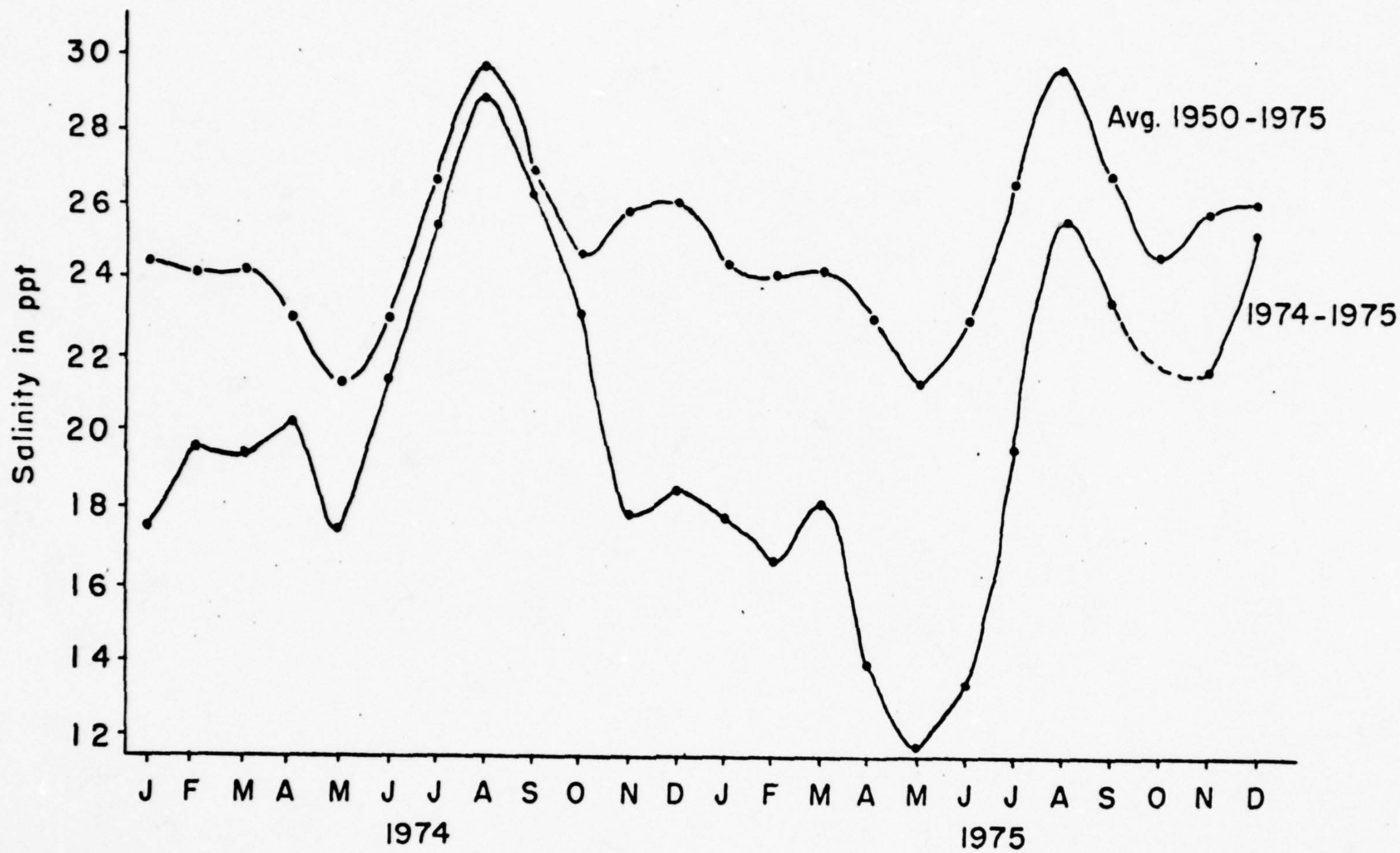


Figure 17. Average Galveston Channel salinity each month, January 1974-December 1975 compared with the average monthly salinity, 1950-1975 (average monthly salinity data points are repeated). October 1975 data point missing; suggested salinity trend indicated by dashed line

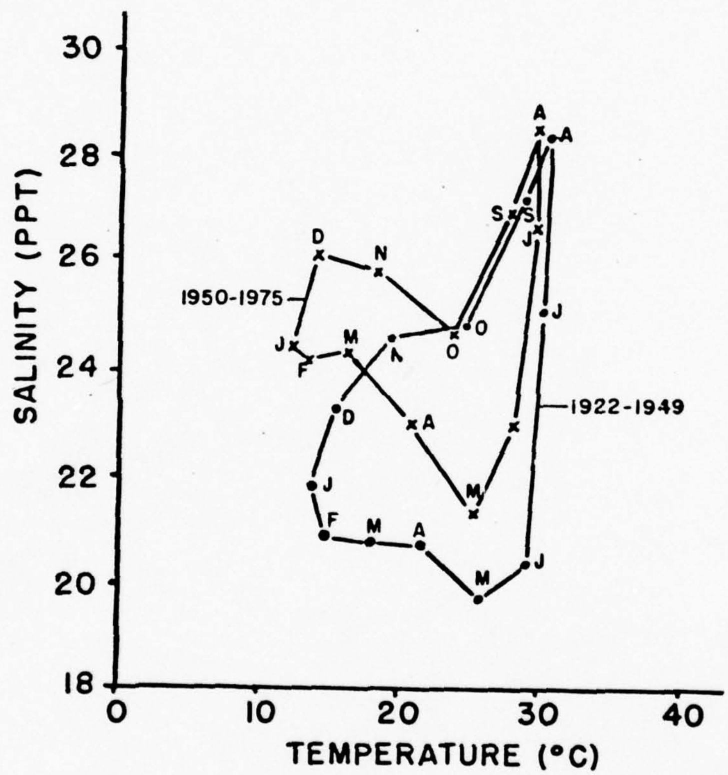


Figure 18. Comparison of the hydrographic climates at Galveston, 1922-1949 and 1950-1975

Fig

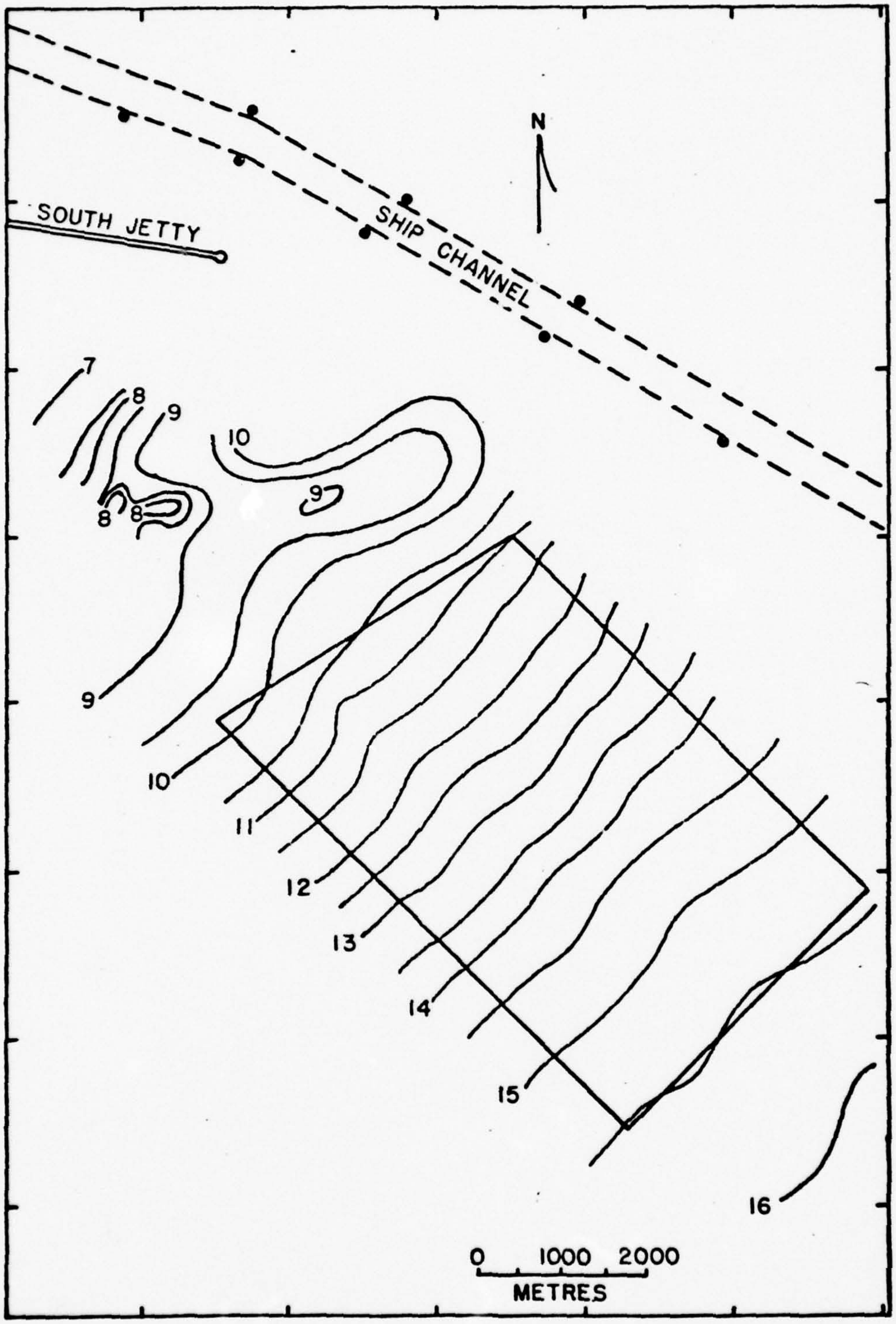


Figure 19. Bathymetry of the dredged material disposal site prior to the experimental study (depths in metres)

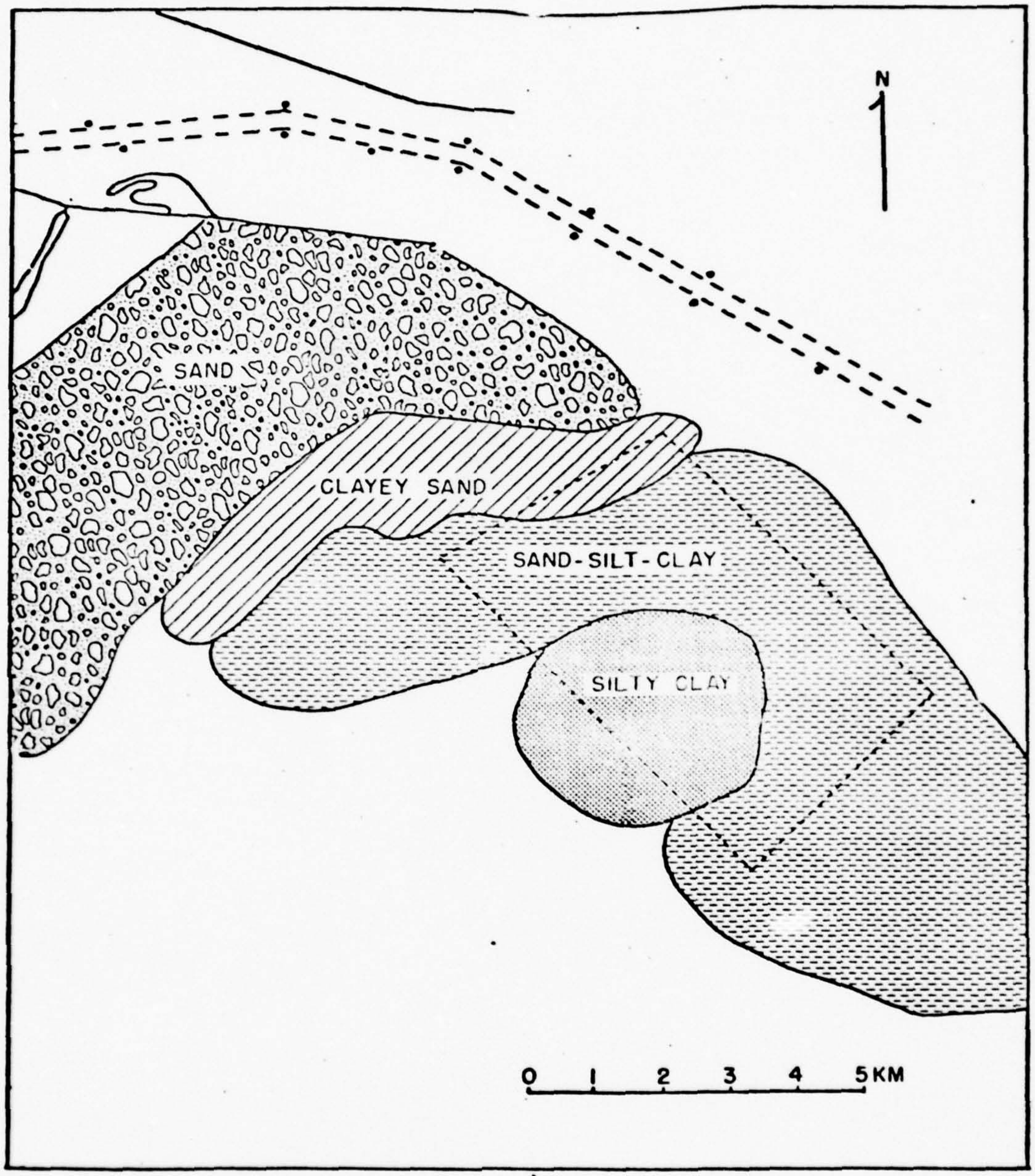


Figure 20. Distribution of sediments in the DMDS and vicinity according to Coulthard (1976)

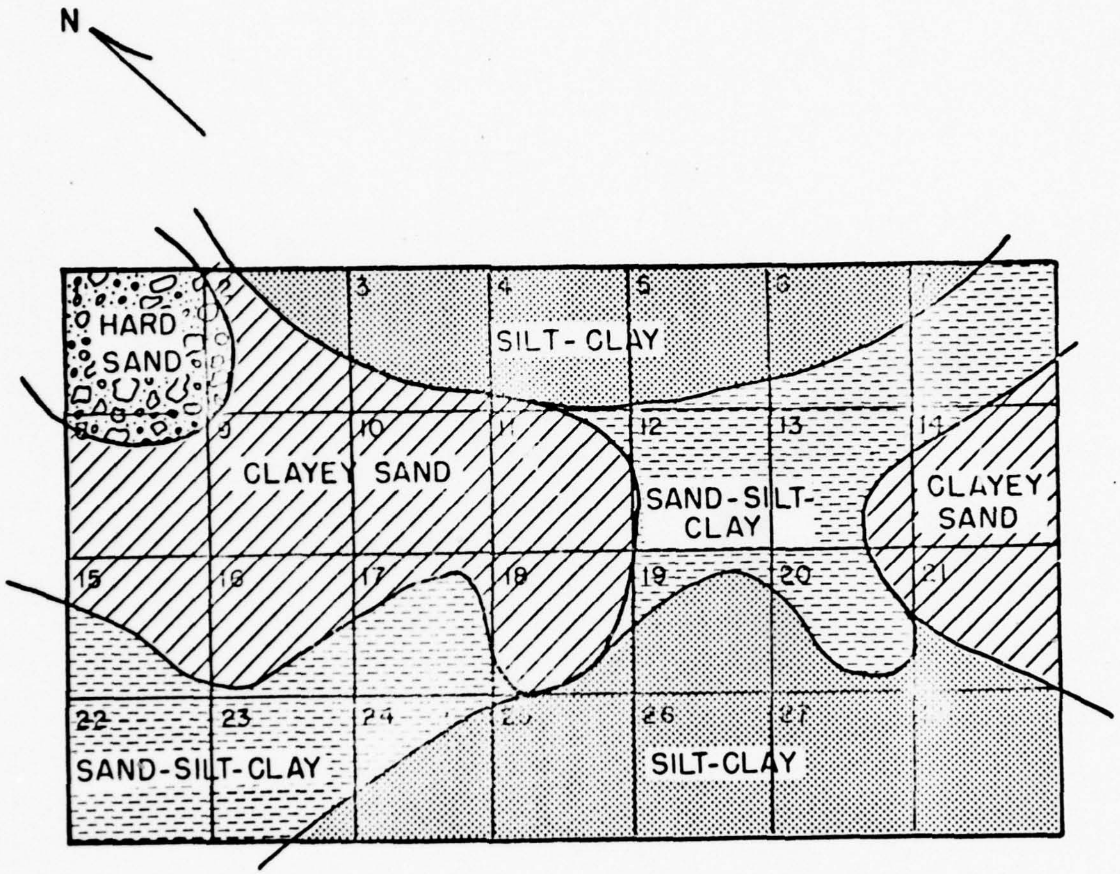


Figure 21. Distribution of sediments in the DMDS according to data collected during the pilot study biological sampling

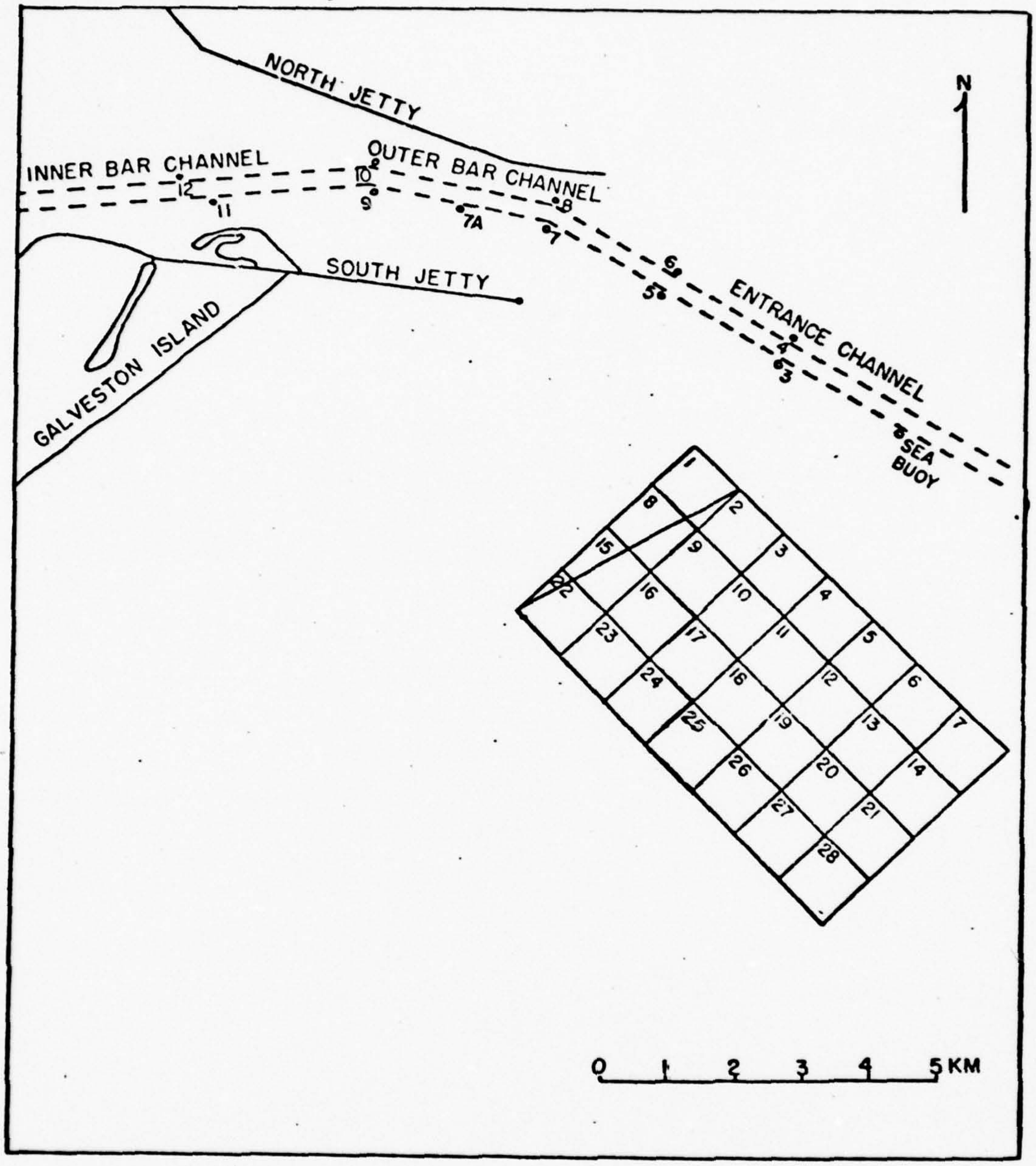


Figure 22. Arrangement of blocks within the DMDS

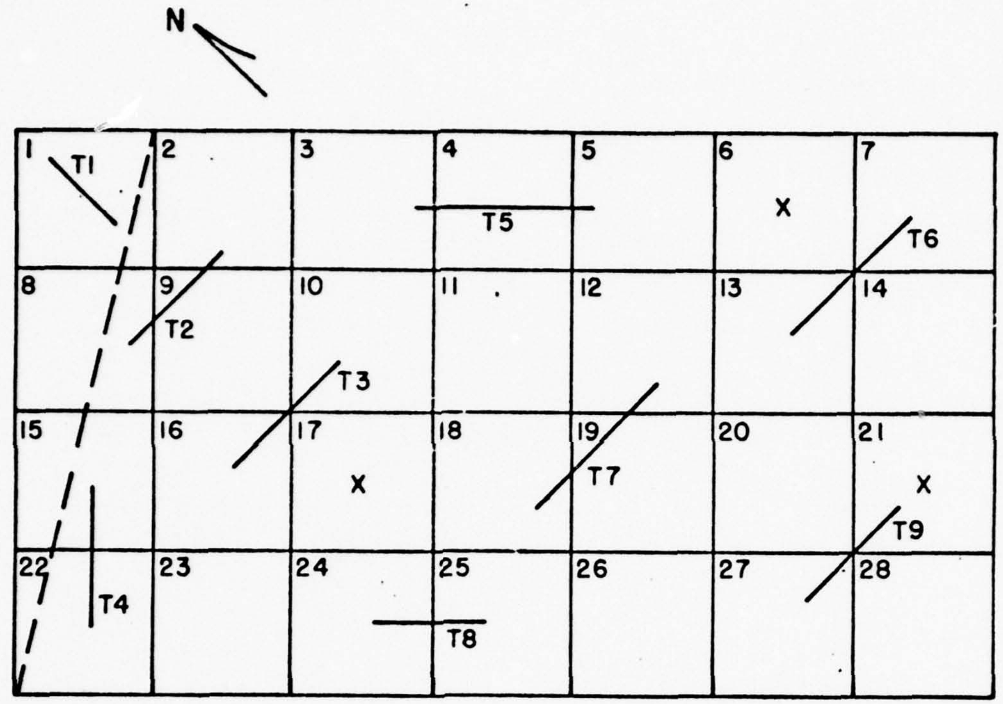


Figure 23. Grid system used for benthic sampling superimposed on map of DMDS. Dotted line represents actual northeastern boundary of DMDS. Trawl stations locations shown (T1-T9). x - sites where 10 replicate benthic samples collected

1 Phoronis architecta 36.5	2 Nereis sp. 14.1	3 Prionospio pinnata 17.5	4 Balanoglossus 53.8	5 24.5	6 Balanoglossus 44.7	7 91.0
8 Phoronis architecta 23.1	9 Phoronis architecta 47.1	10 Prionospio pinnata 19.2	11 Lumbrine. tenuis 13.5	12 Balanoglossus 82.3	13 36.8	14 84.0
15 Prionospio pinnata 20.9	16 Phoronis architecta 27.8	17 Balanoglossus, Magelona sp. 13.6	18 Diopatra cuprea 26.3	19 Balanoglossus 94.5	20 79.8	21 Prionospio pinnata 29.6
22 Thalassema hartmani 24.1	23 Balanoglossus 76.1	24 64.0	25 Balanoglossus 30.5	26 78.4	27 Balanoglossus 71.4	28 84.9

Figure 24. Dominant species and percentage of that species in total population in each block of DMDS

1 20	2 23	3 23	4 21	5 9	6 10	7 30
8 18	9 39	10 21	11 27	12 19	13 22	14 22
15 39	16 34	17 22	18 8	19 14	20 9	21 27
22 34	23 27	24 18	25 16	26 23	27 14	28 22

Figure 25. Total number of species at each station in the DMDS during the pilot study

Fig 26

1 680	2 680	3 824	4 848	5 288	6 304	7 9064
8 648	9 3144	10 528	11 592	12 2984	13 1064	14 3256
15 1072	16 2072	17 528	18 152	19 5704	20 1408	21 1136
22 2024	23 3352	24 912	25 656	26 2520	27 1512	28 3224

Figure 26. Average number of individuals per m^2 at each station in the DMDS during the pilot study

Fig 27

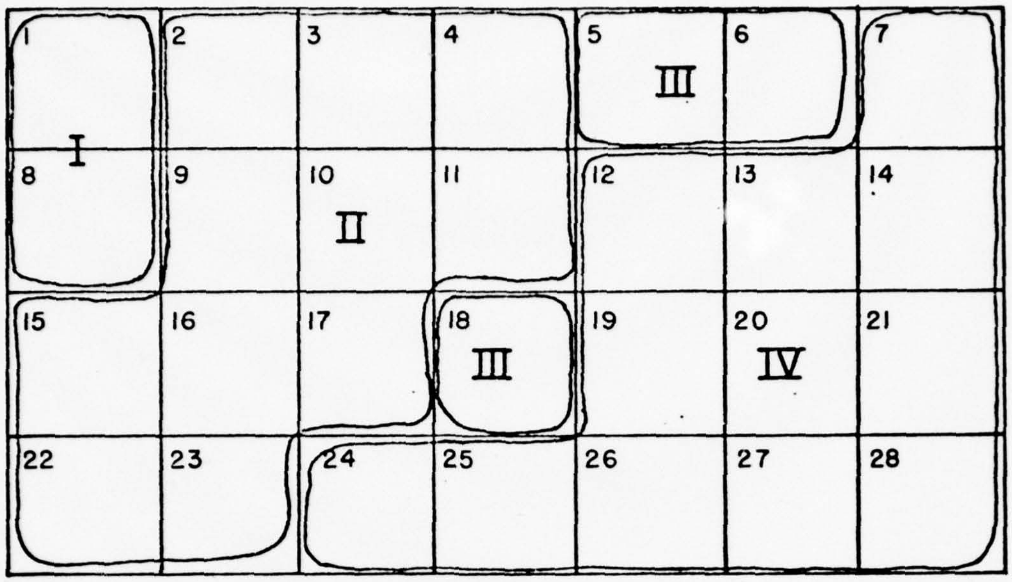


Figure 27. Pilot study site groups in the DMDS based on 70 species

Fig 28

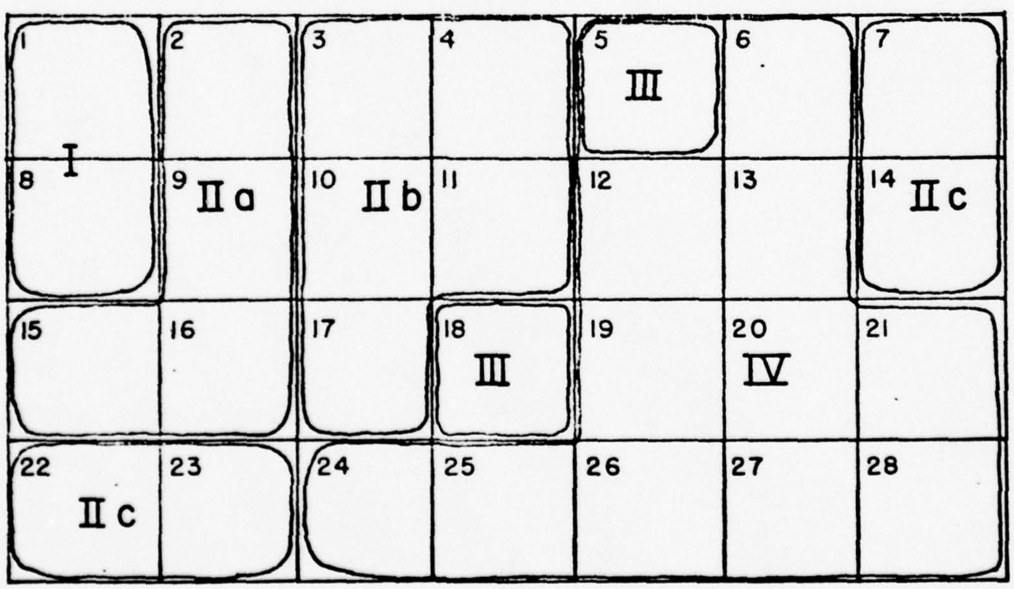


Figure 28. Pilot study site groups in the DMDS based on 41 species

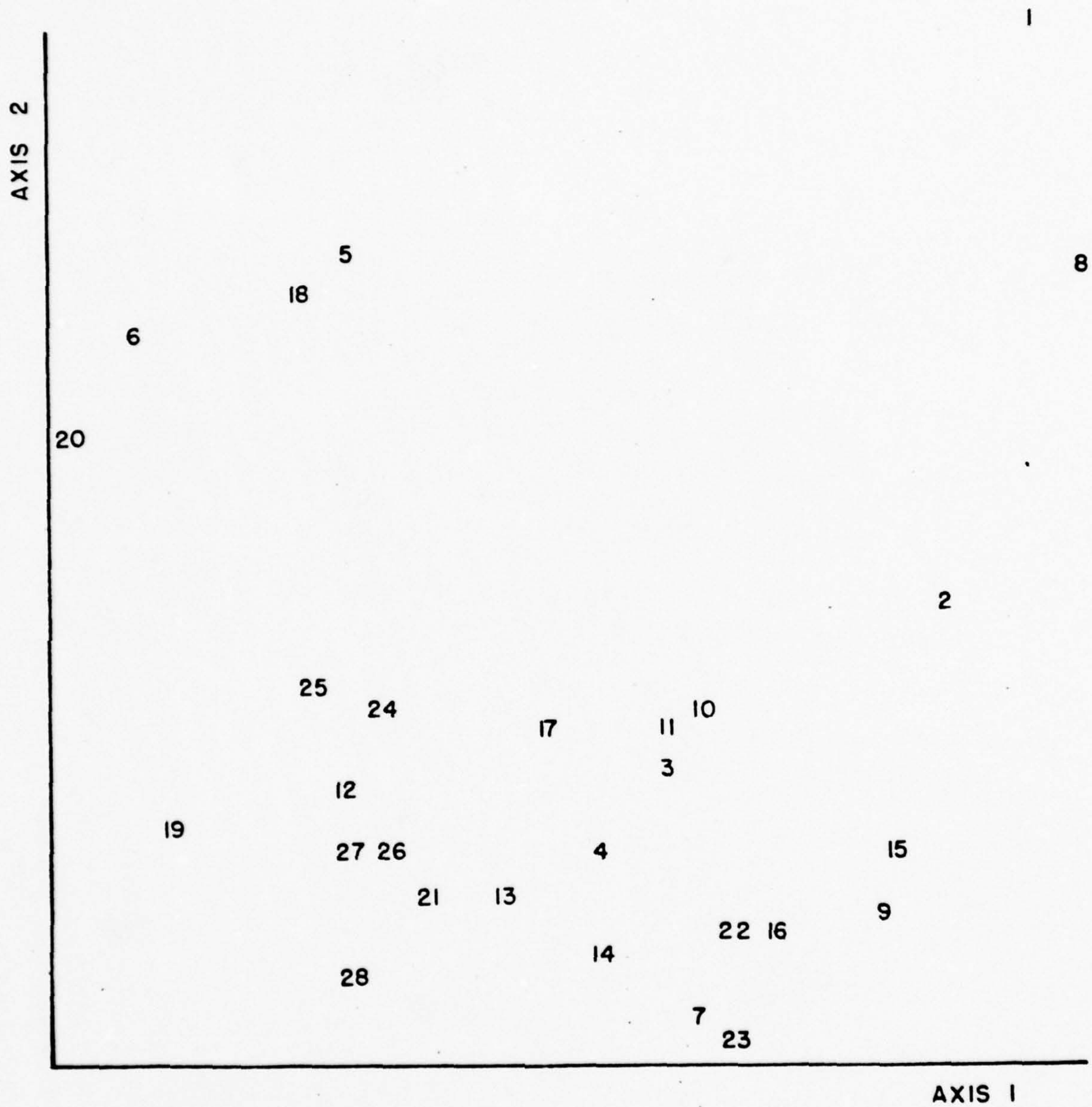


Figure 29. Ordination plots of the pilot study biotic data showing the two-dimensional locations of stations in relation to axes 1 and 2

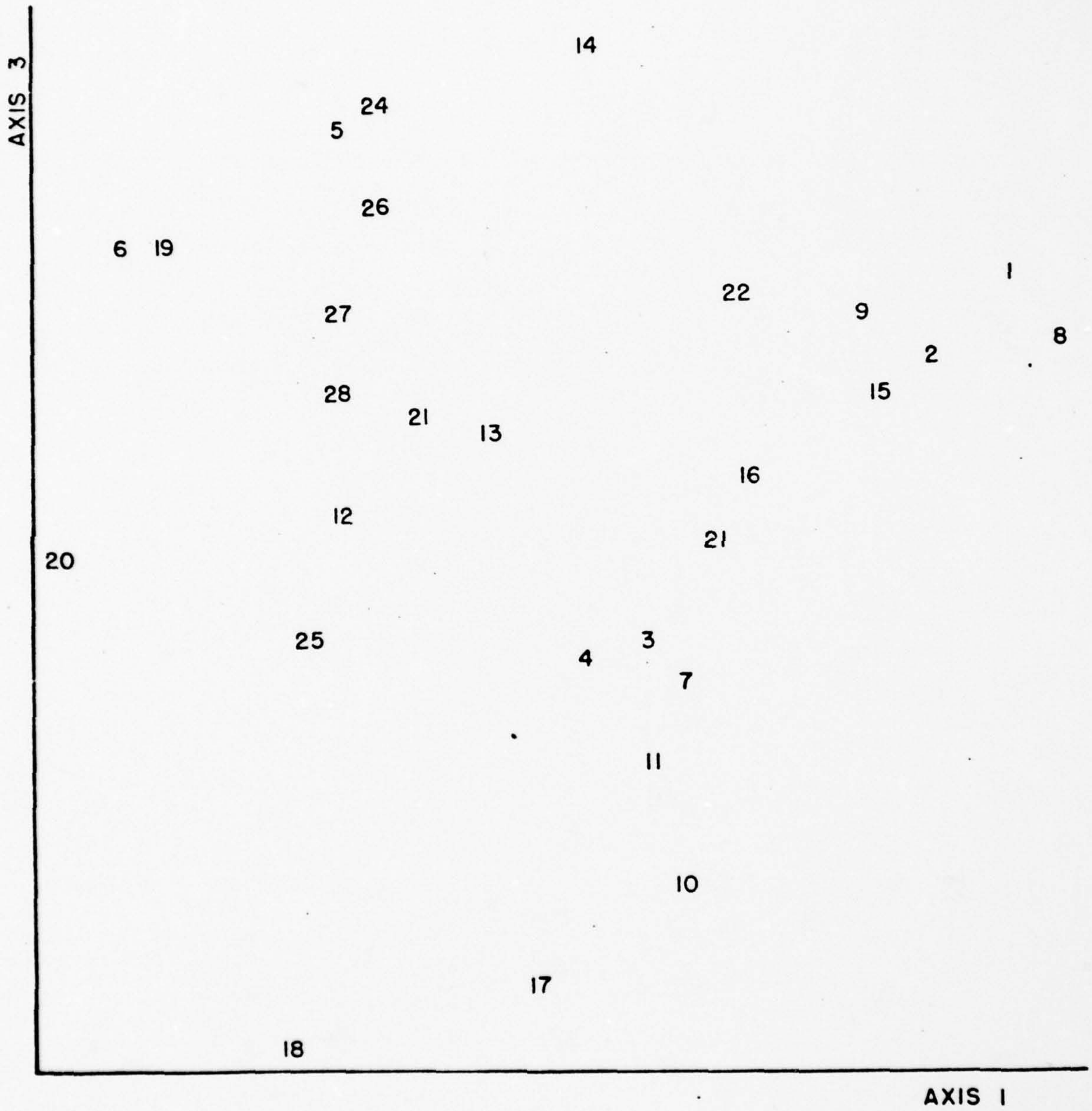


Figure 30. Ordination plots of the pilot study biotic data showing the two-dimensional locations of stations in relation to axes 1 and 3

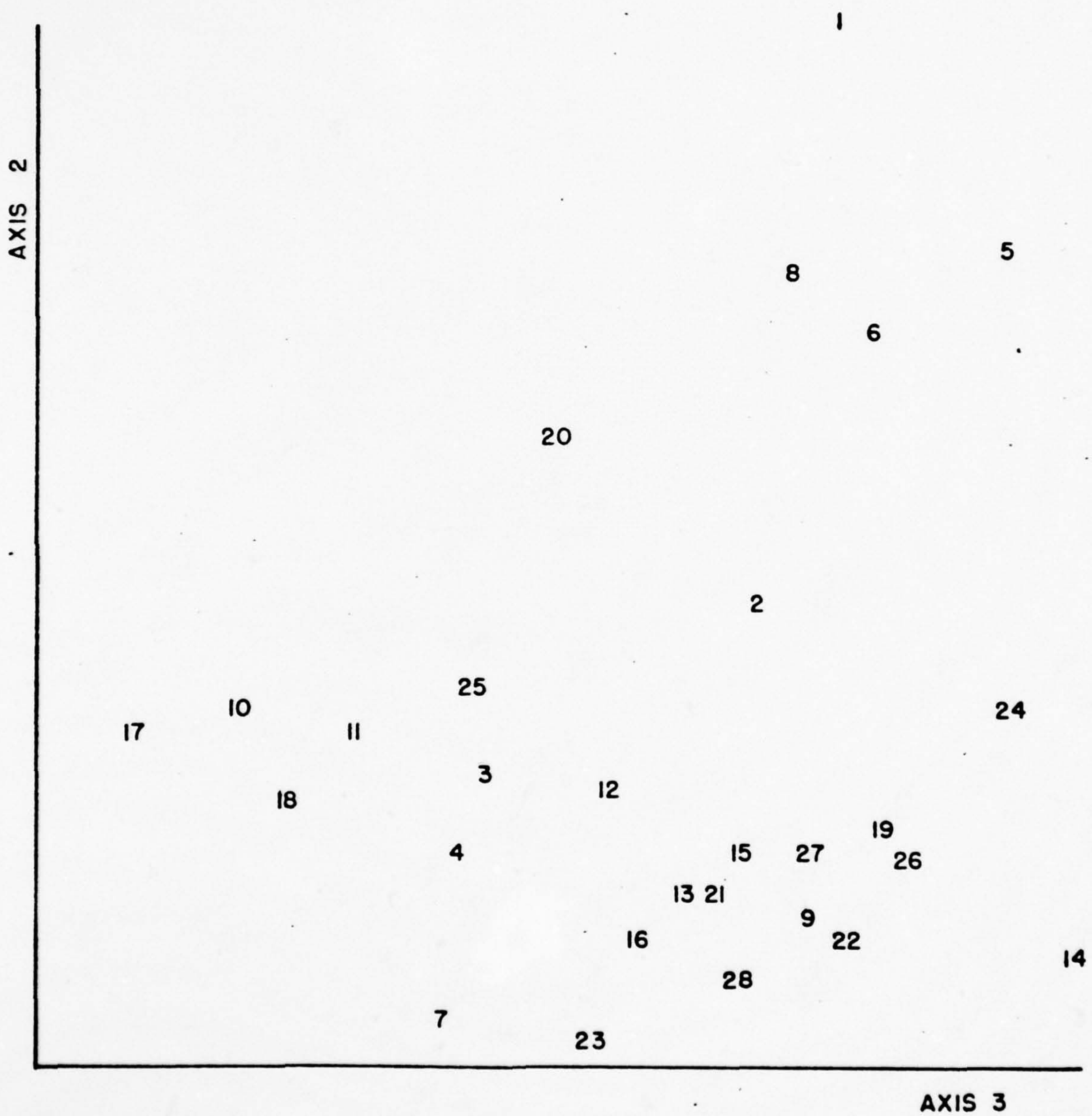


Figure 31. Ordination plots of the pilot study biotic data showing the two-dimensional locations of stations in relation to axes 2 and 3

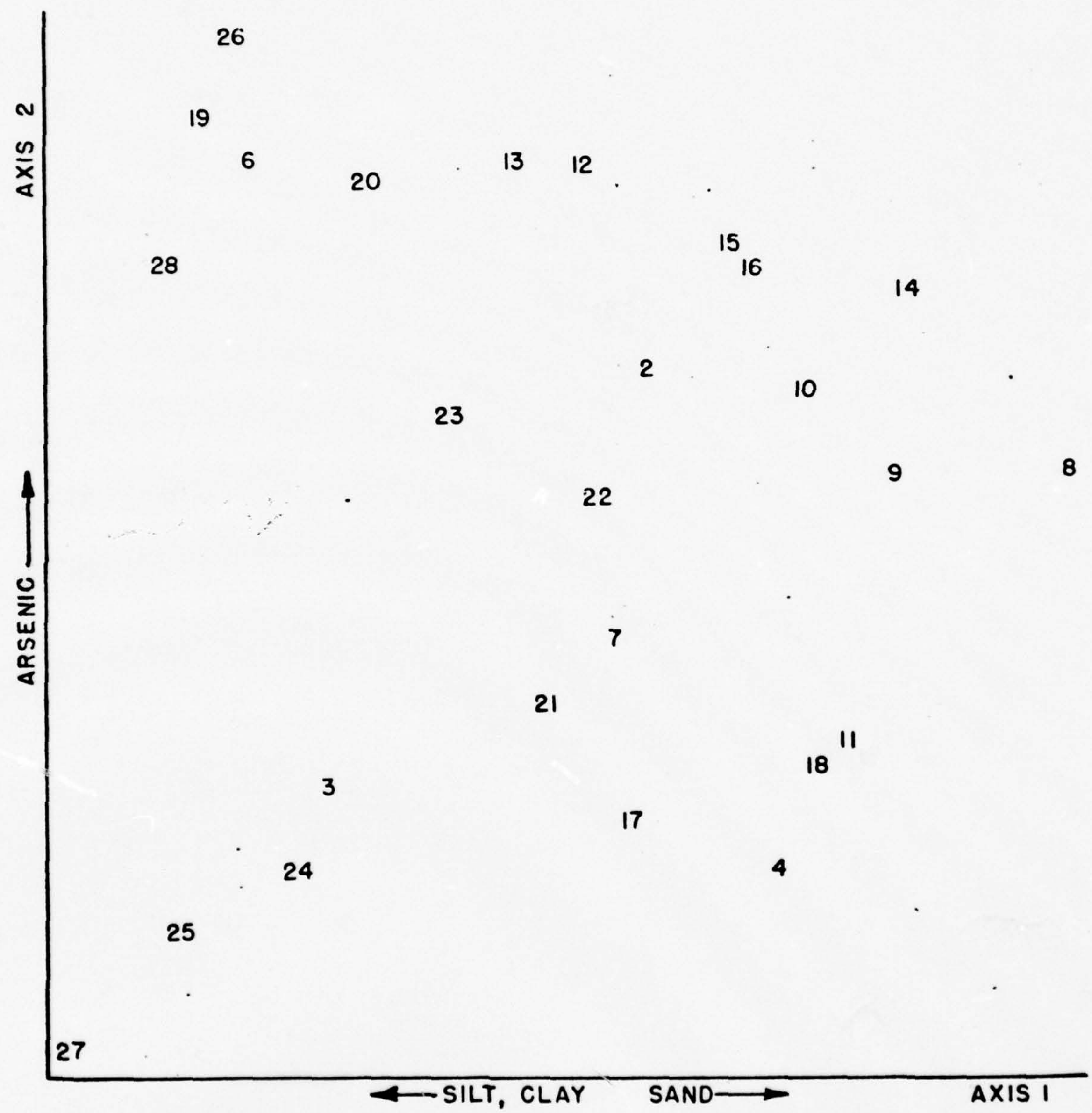


Figure 32. Principal components analysis plots of the pilot study abiotic data showing the two-dimensional locations of stations in relation to axes 1 and 2

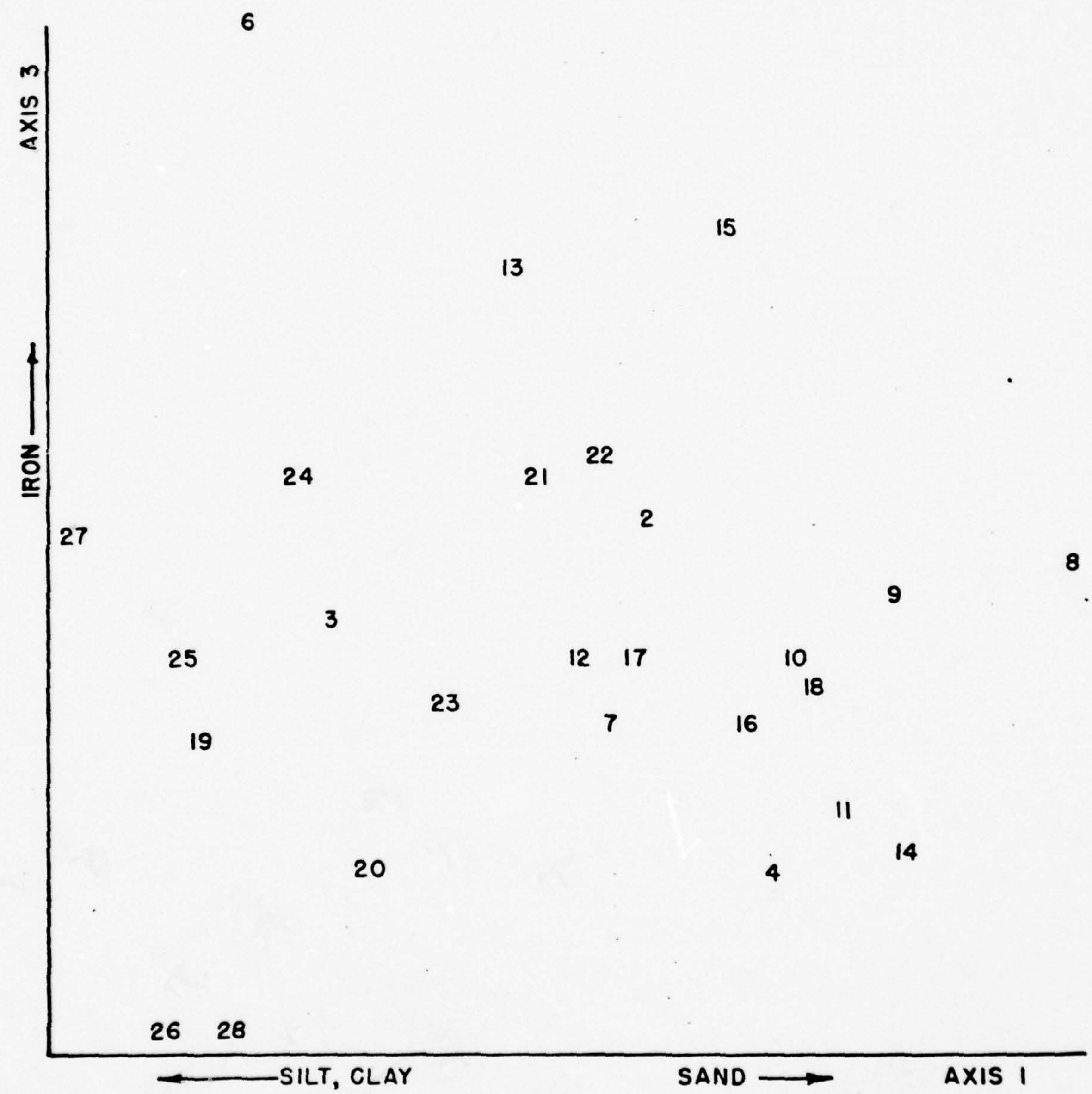


Figure 33. Principal components analysis plots of the pilot study abiotic data showing the two-dimensional locations of stations in relation to axes 1 and 3

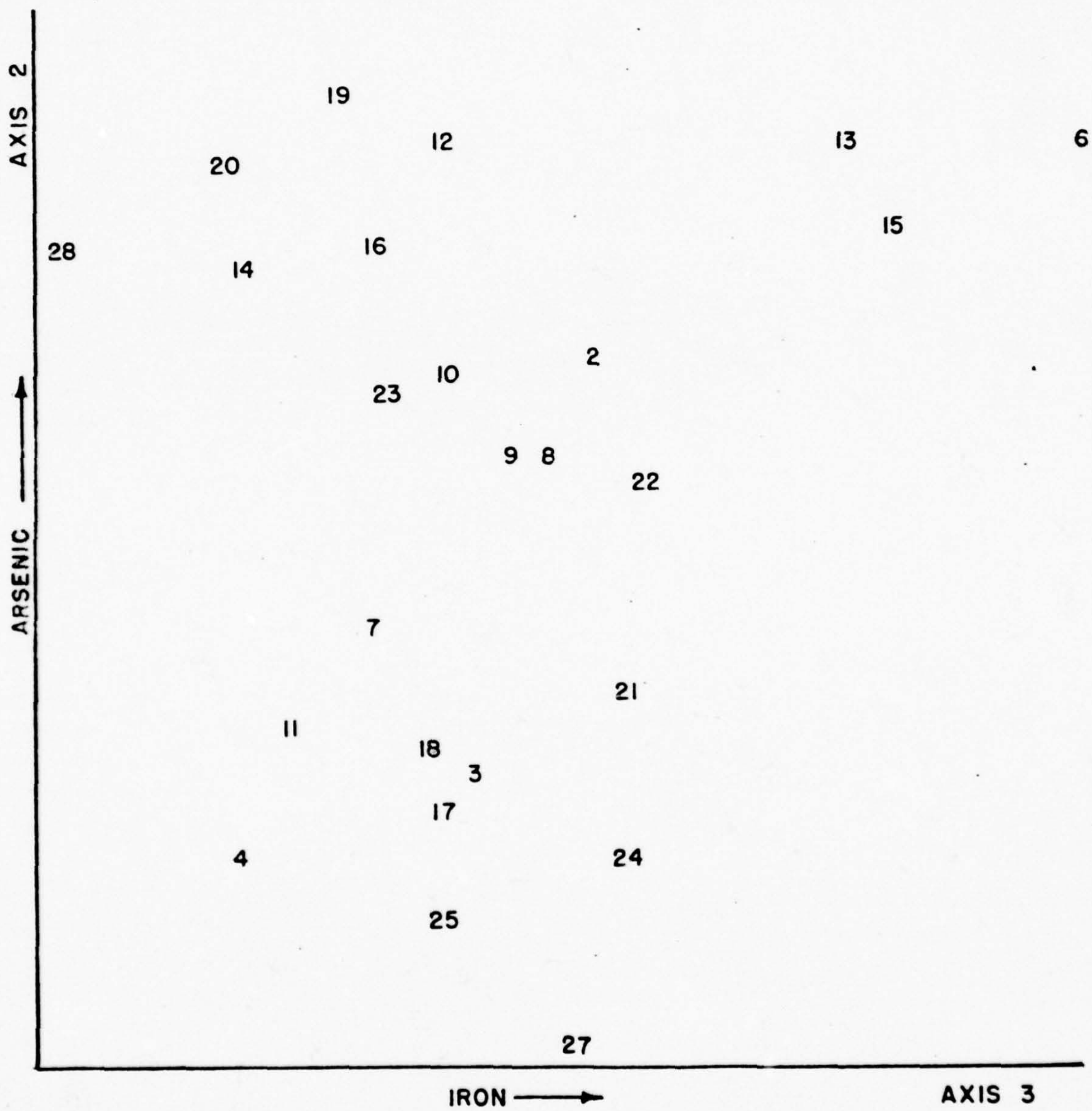


Figure 34. Principal components analysis of the pilot study abiotic data showing the two-dimensional locations of stations in relation to axes 2 and 3

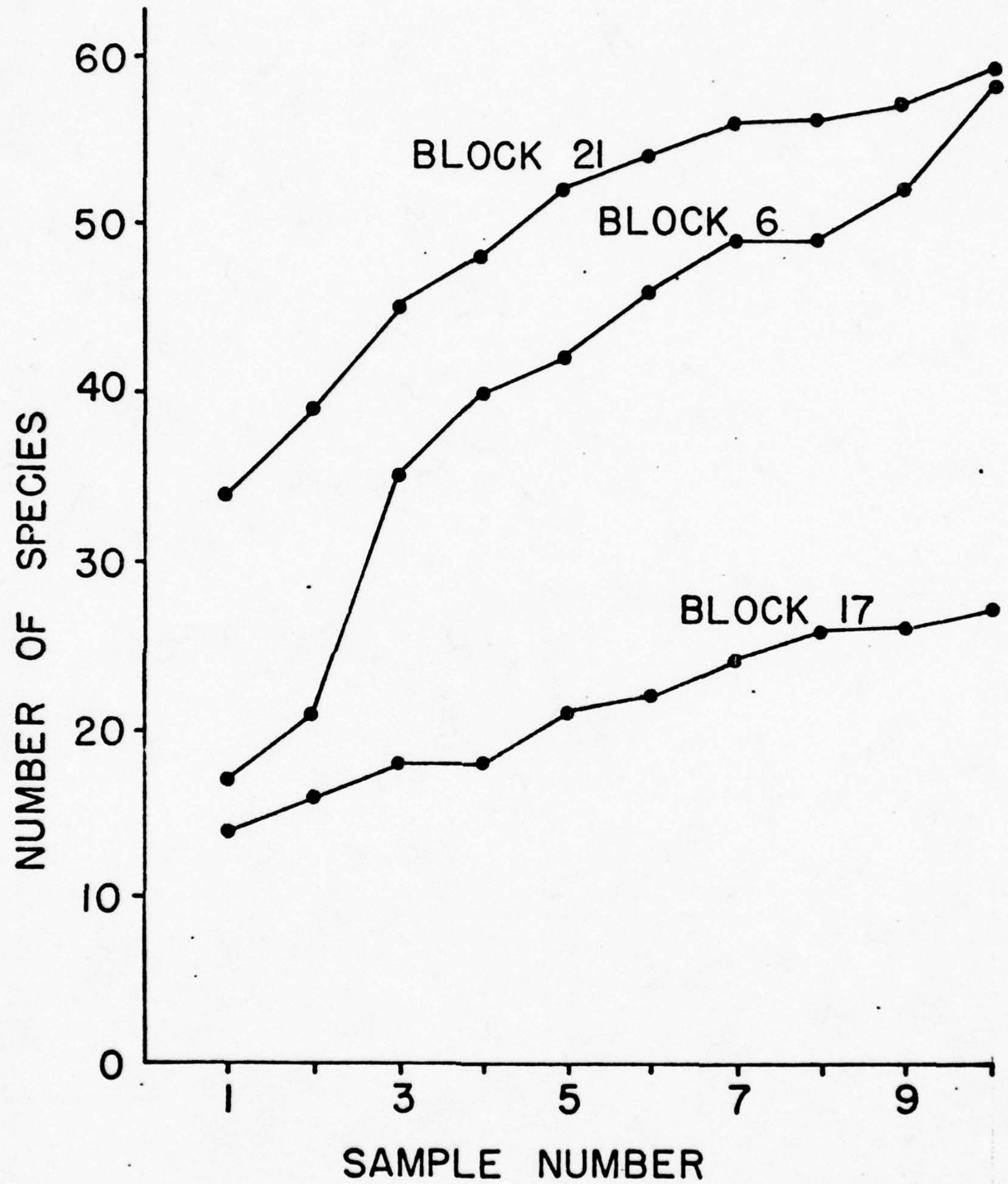


Figure 35. Species acquisition curves for stations in DMDS blocks 6, 17, and 21, sampled on 3 and 6 May 1975

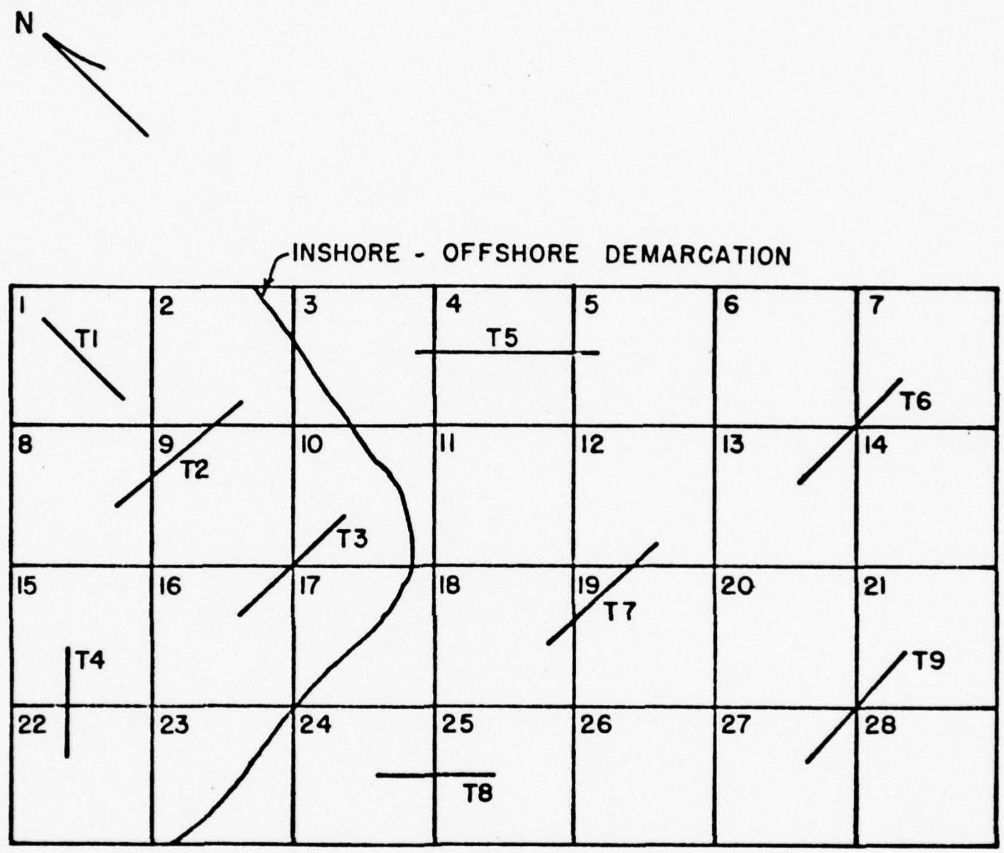


Figure 36. Locations of the 9 trawl stations in the DMDS occupied during the pilot study and the division of the DMDS into inshore (T1-T4) and offshore (T5-T9) groups

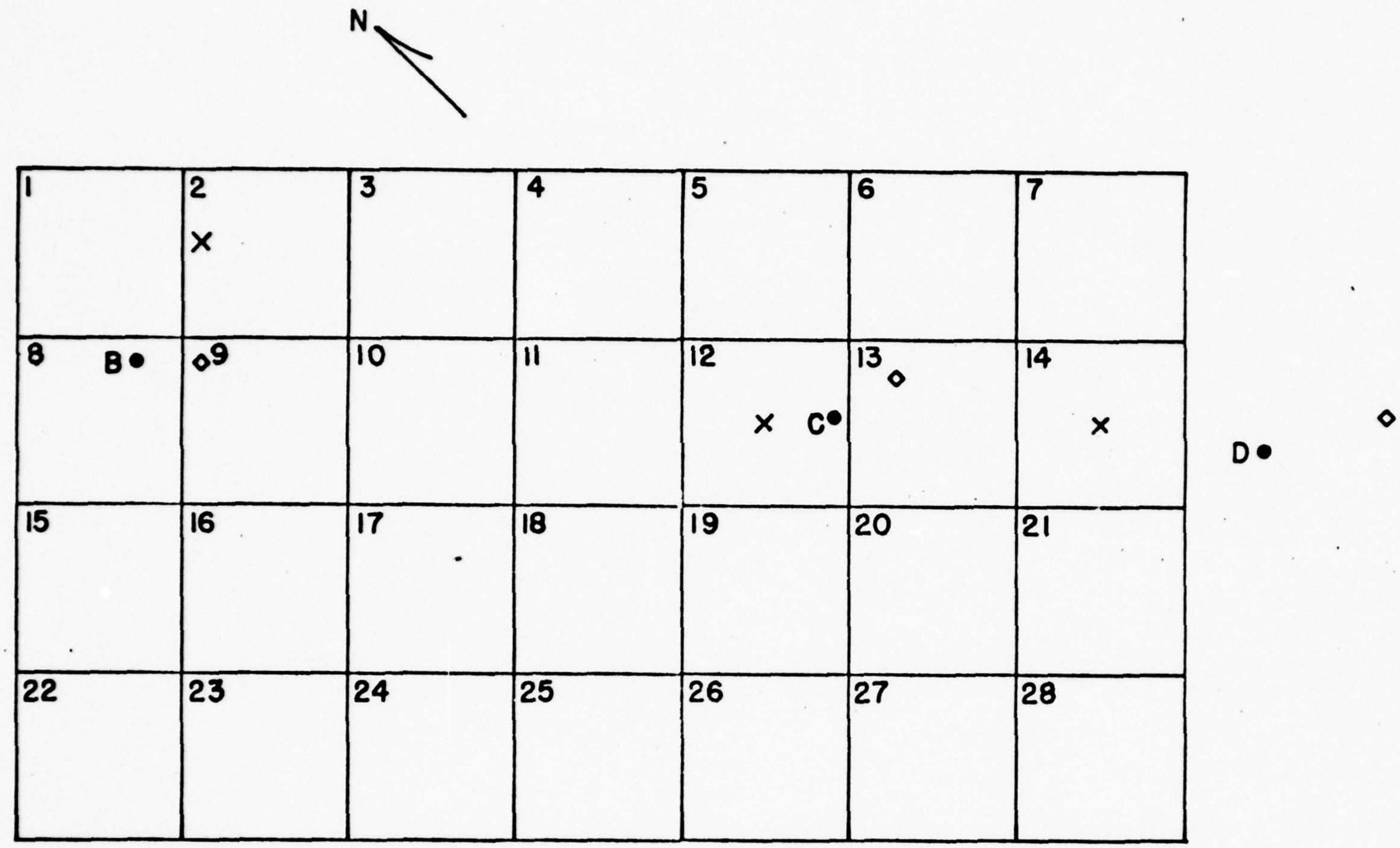


Figure 37. Intended locations of buoys B, C, and D (x), positions calculated in September 1975 (◇), and recalculated positions (●)

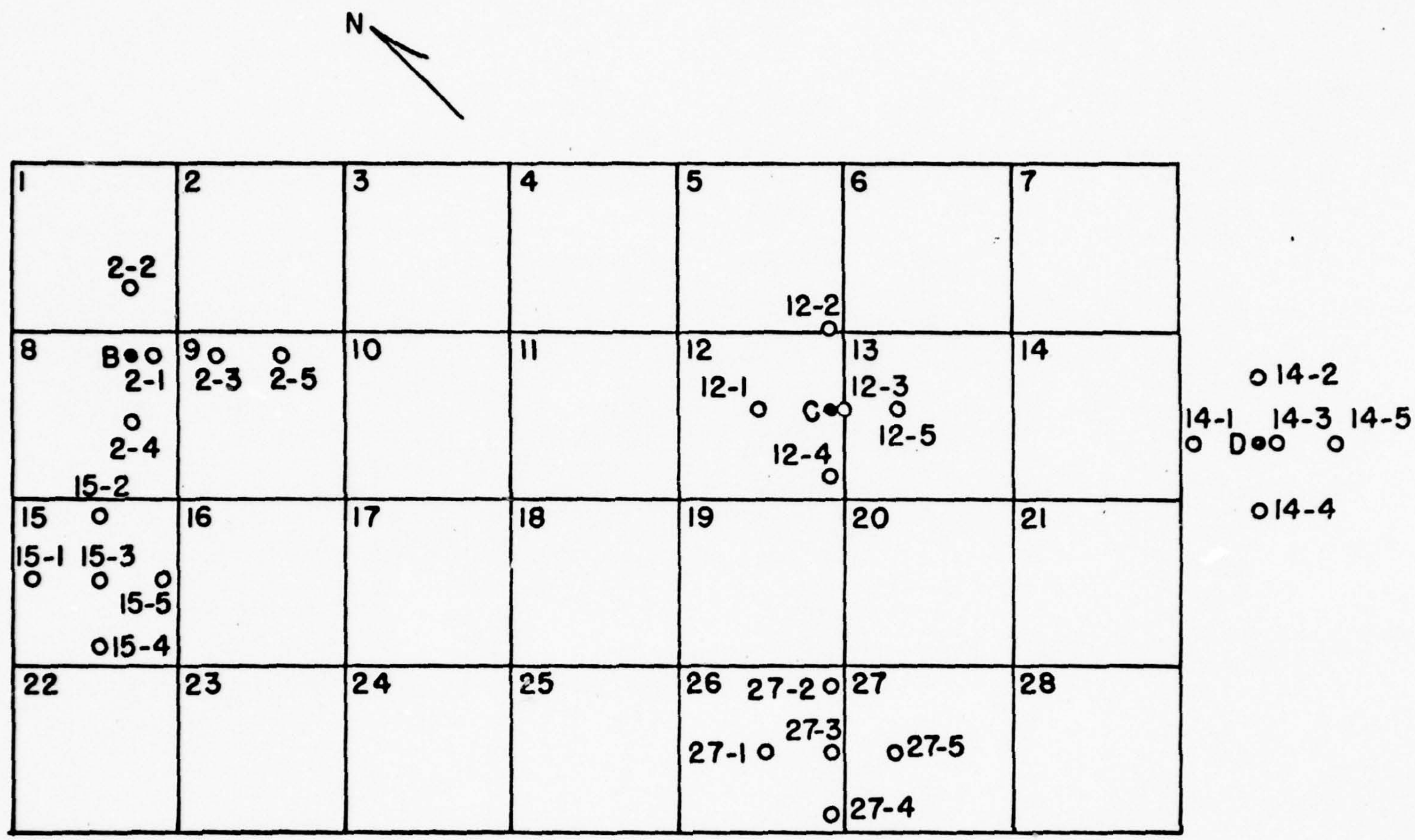


Figure 38. Locations of stations occupied during the experimental study.

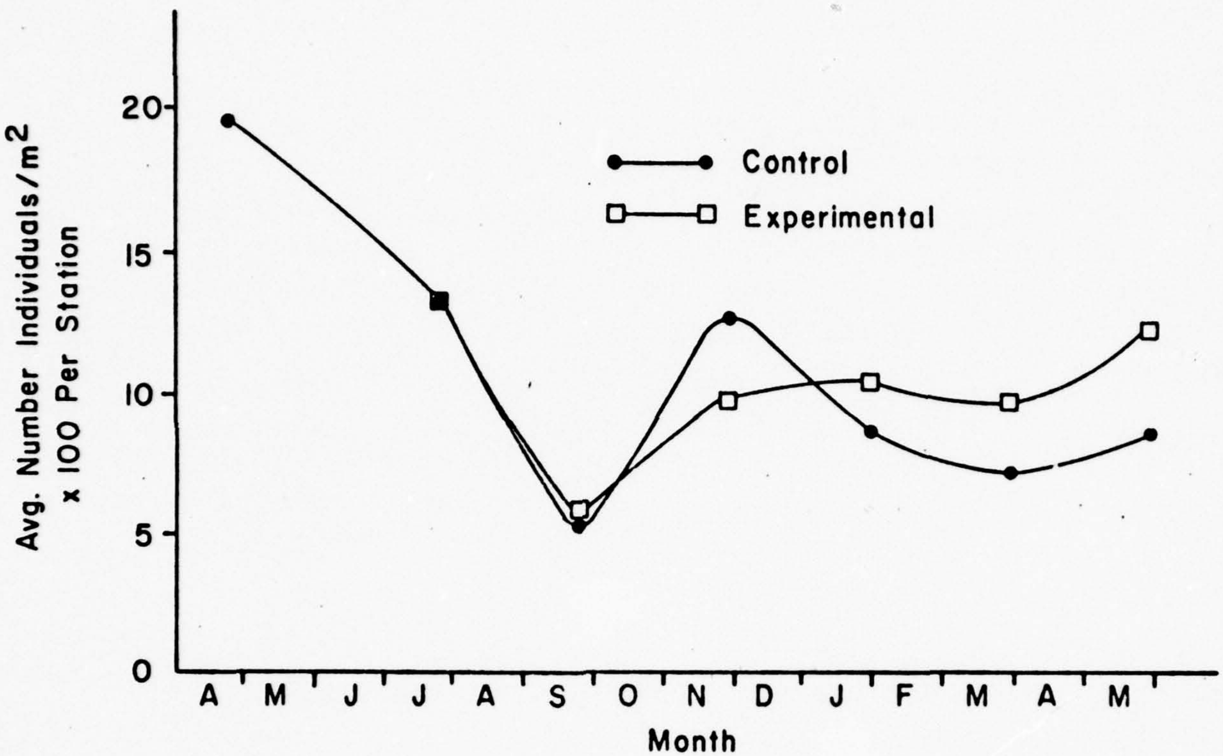


Figure 39. Temporal trends of average benthic populations at control and experimental stations in the DMDS

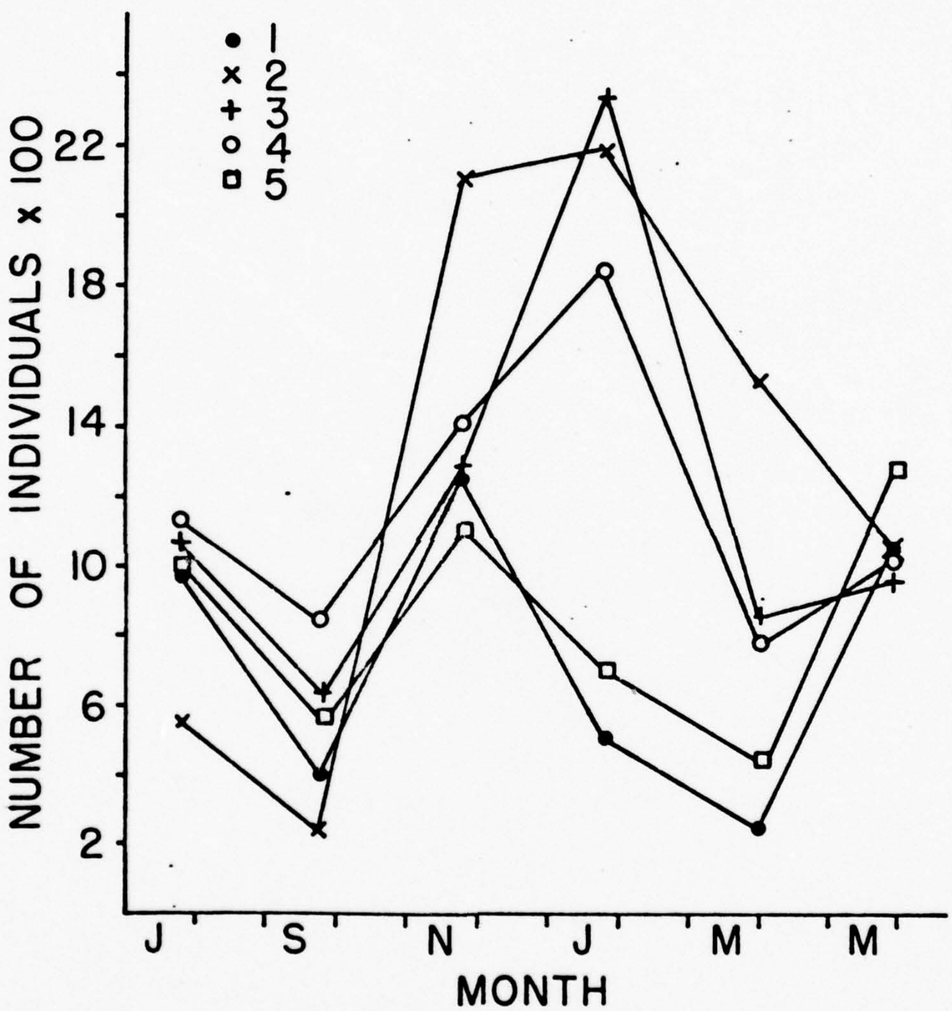


Figure 40. Temporal changes in benthic populations at block 2 stations

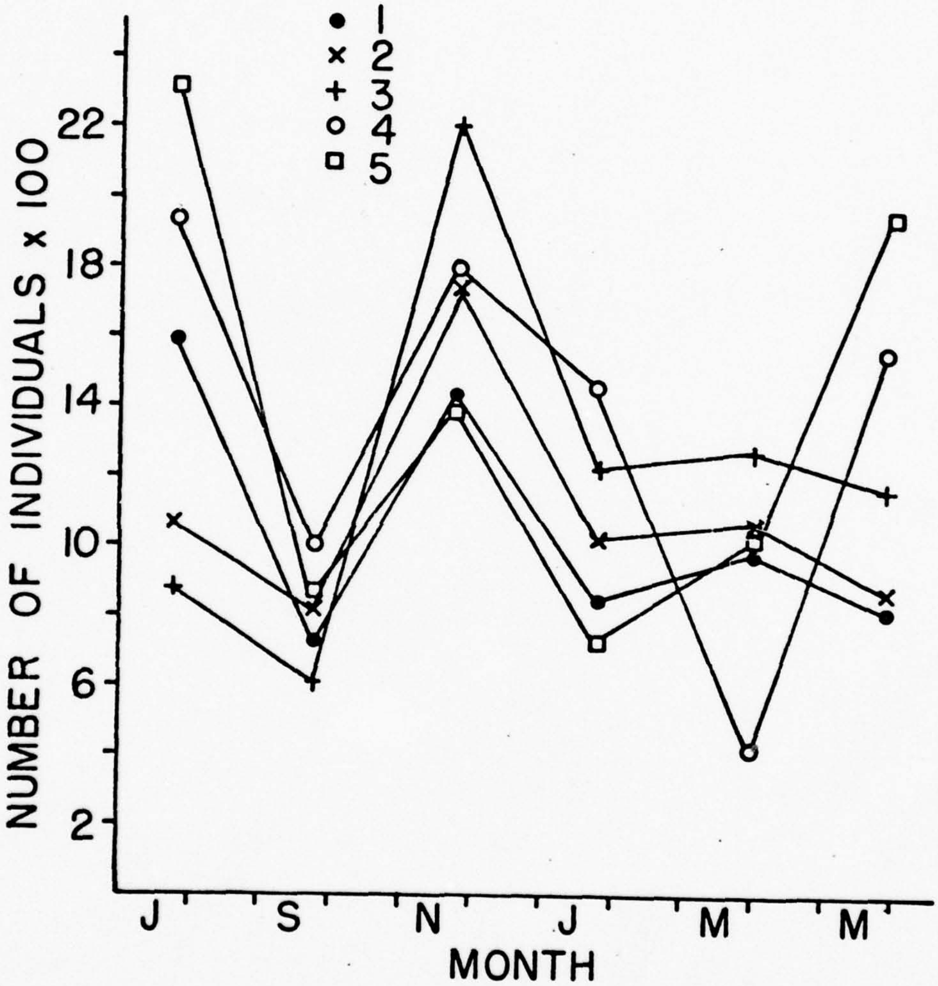


Figure 41. Temporal changes in benthic populations at block 15 stations

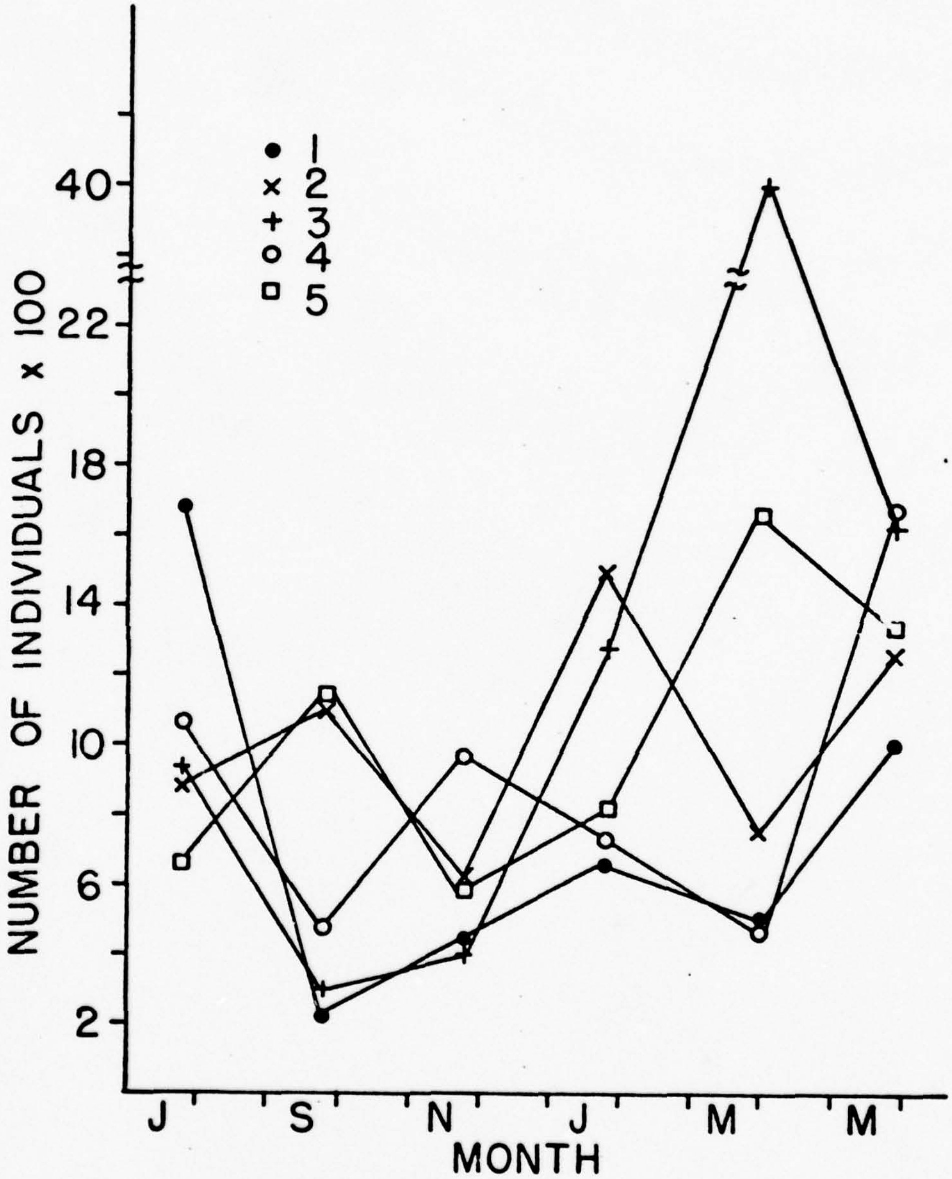


Figure 42. Temporal changes in benthic populations at block 12 stations

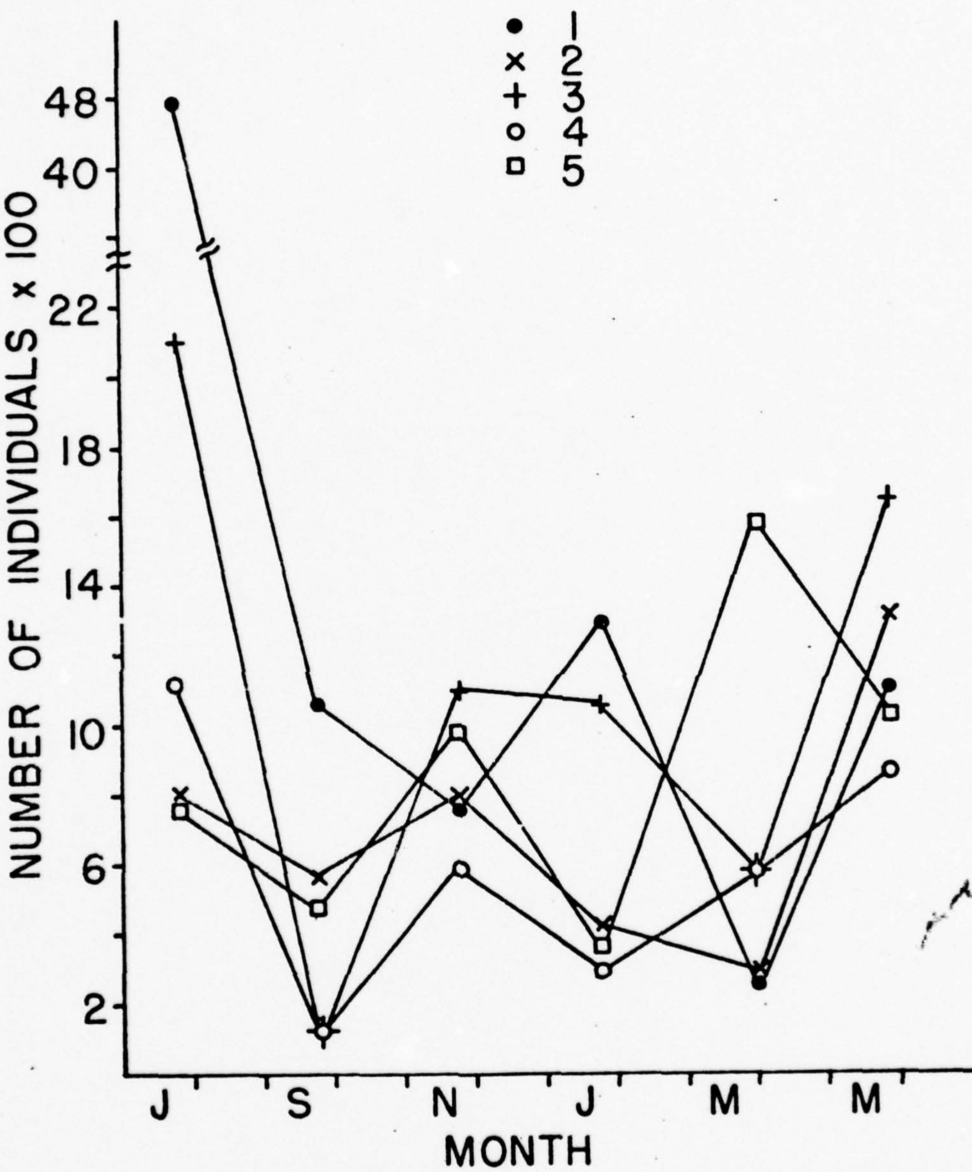


Figure 43. Temporal changes in benthic populations at block 14 stations

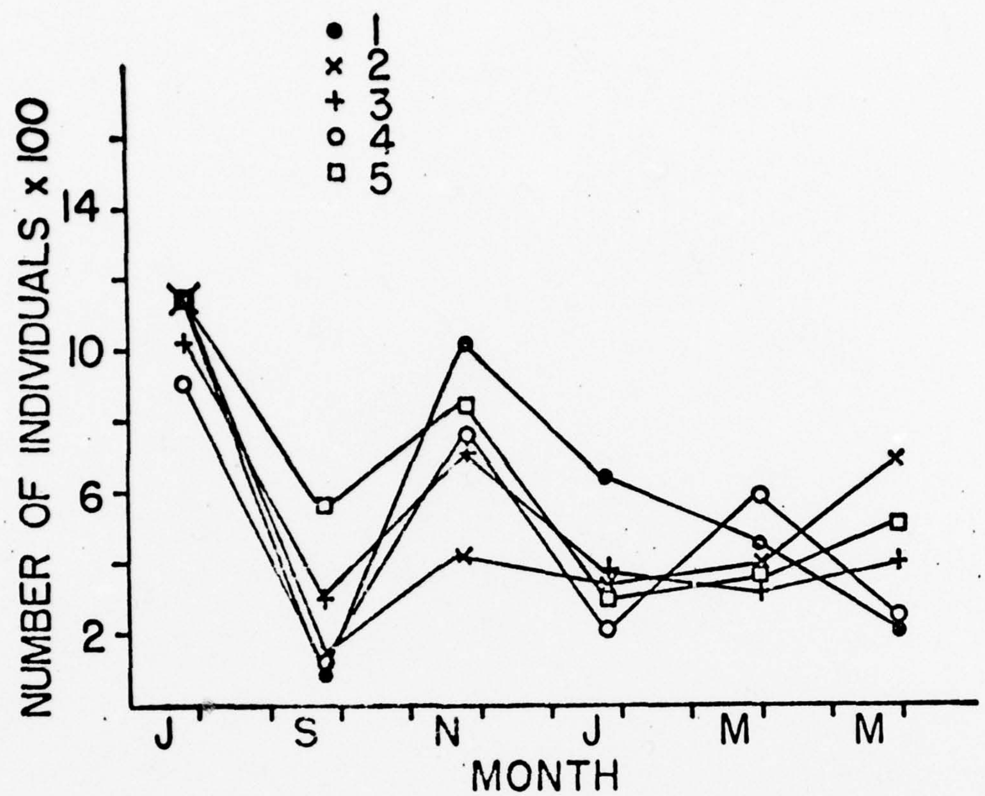


Figure 44. Temporal changes in benthic populations at block 27 stations

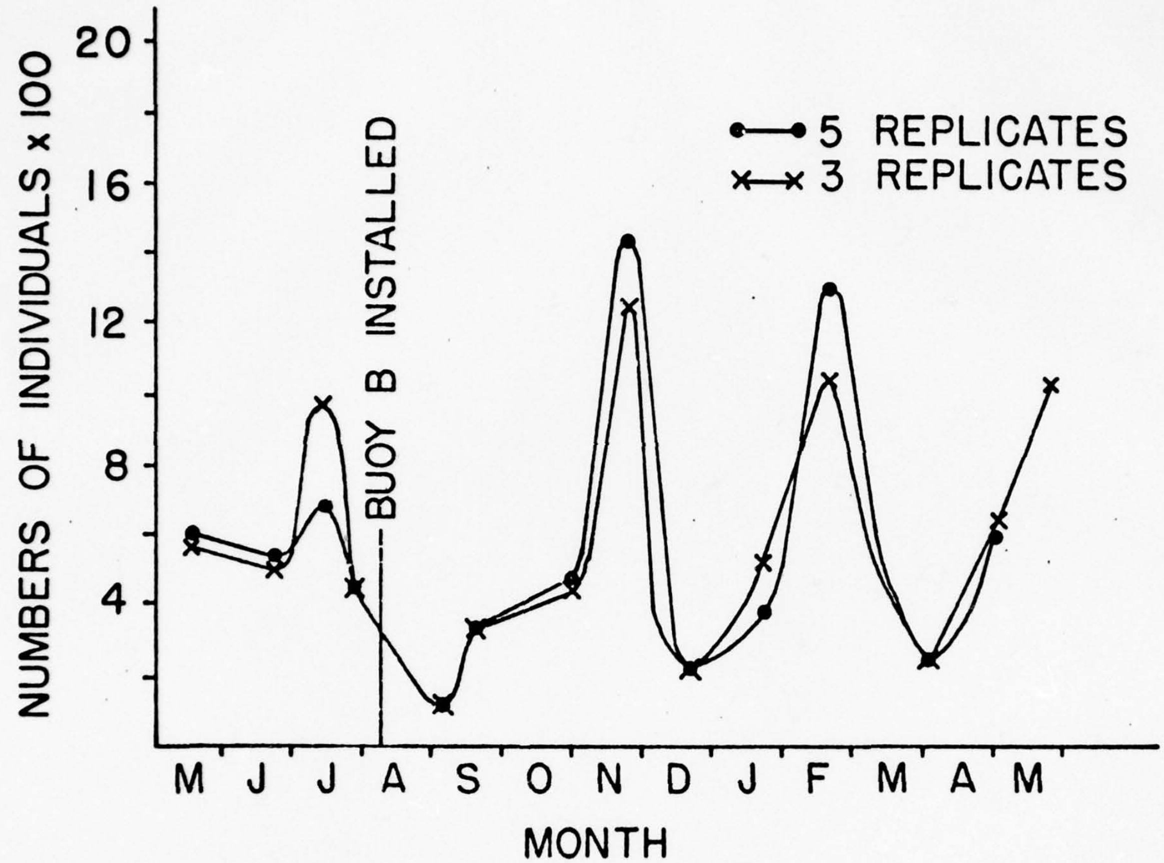


Figure 45. Temporal trends of the benthic populations sampled by Henry (1976) at station 2-1 in the DMDS

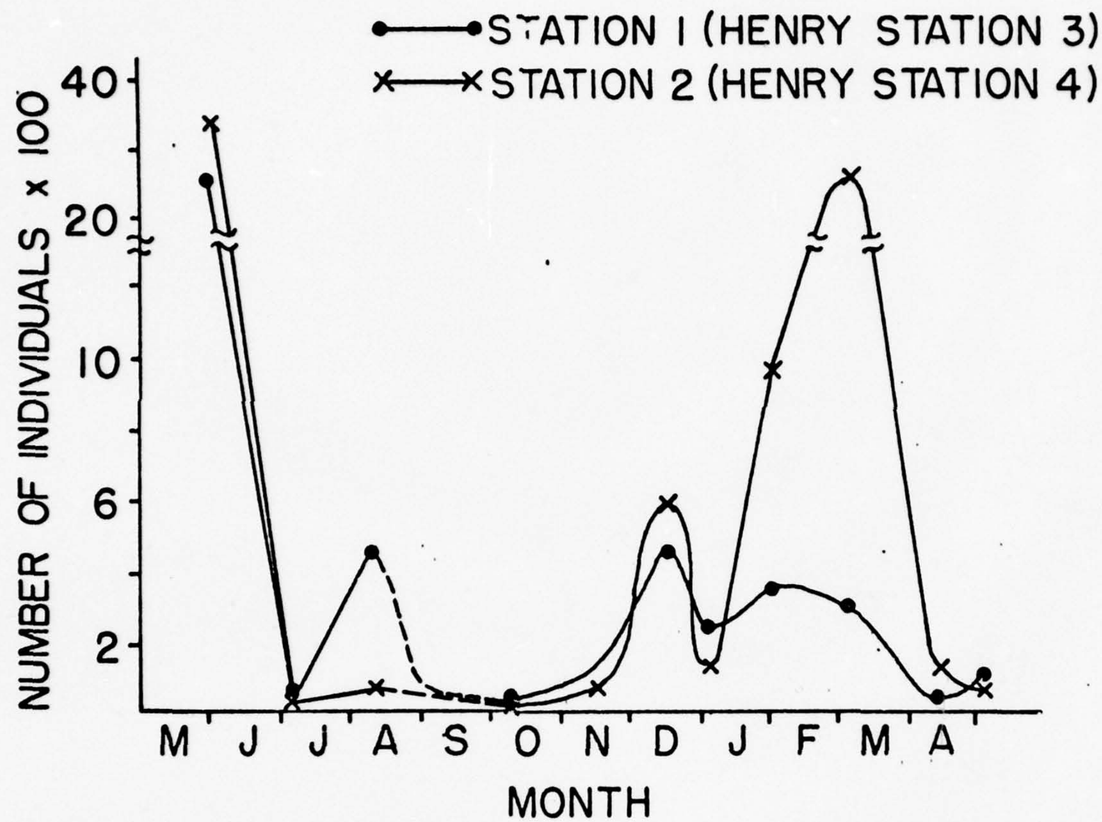


Figure 46. Temporal trends of the benthic populations in the entrance channel stations sampled by Henry (1976)

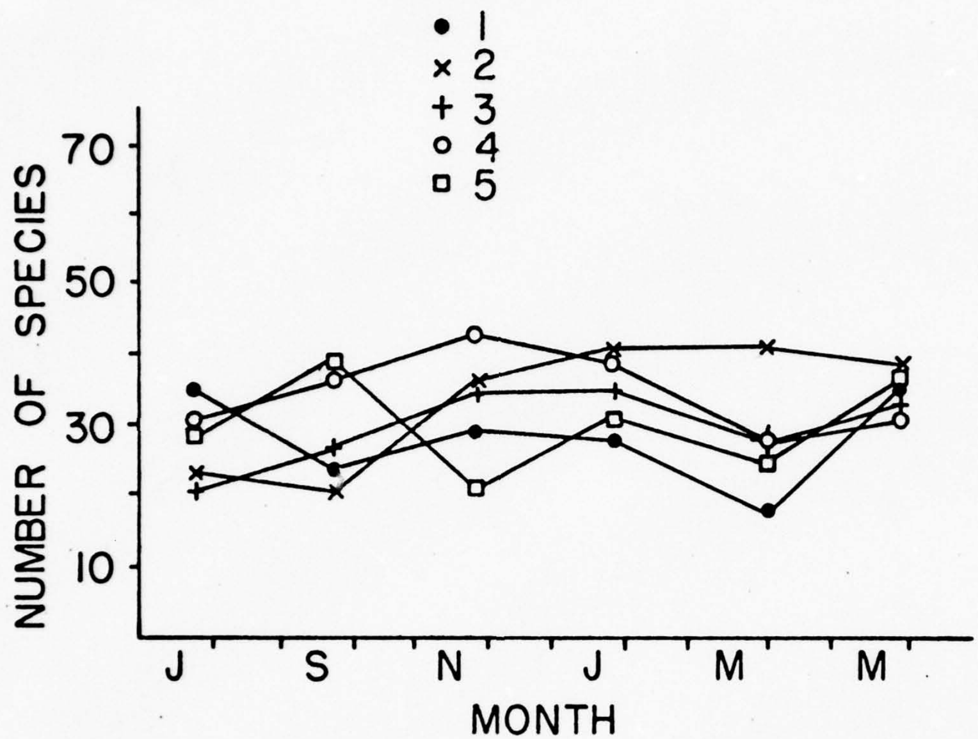


Figure 47. Temporal changes in benthic diversity at stations in block 2

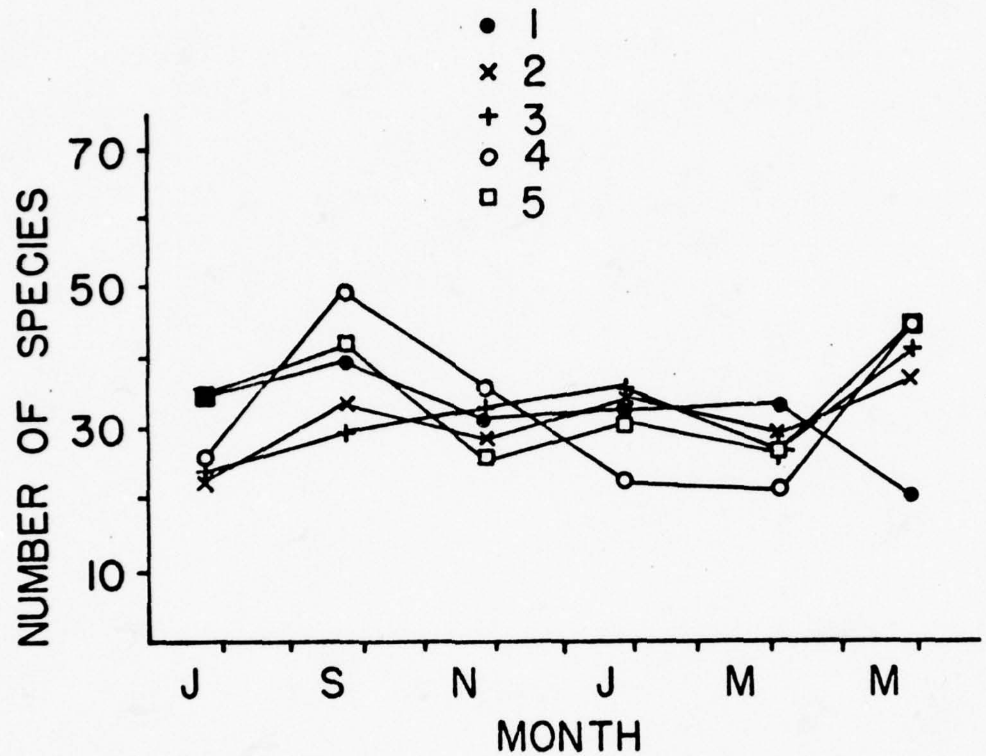


Figure 48. Temporal changes in benthic diversity at stations in block 15

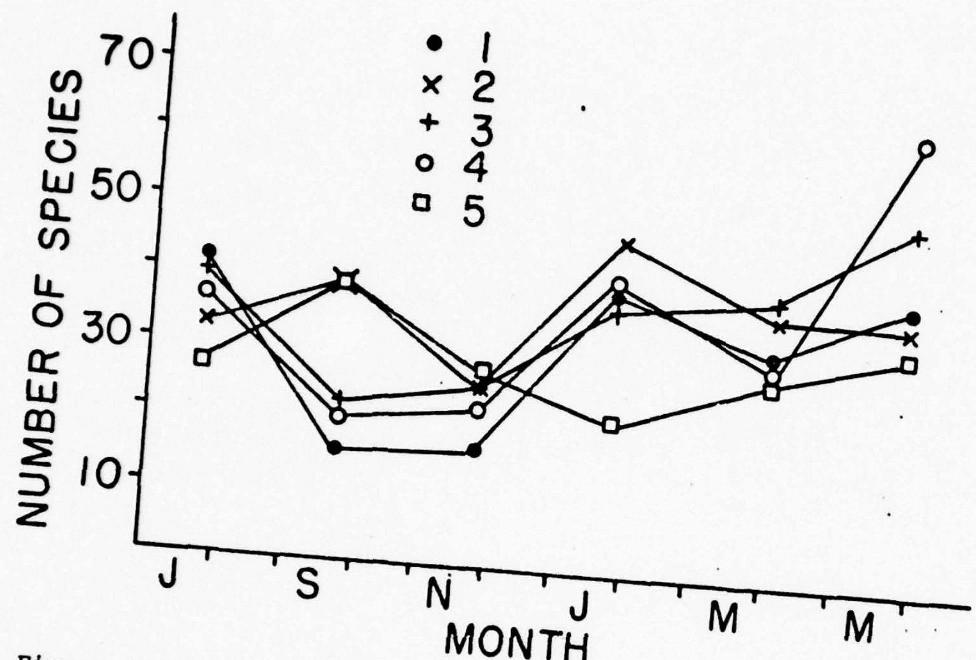


Figure 49. Temporal changes in benthic diversity at stations in block 12

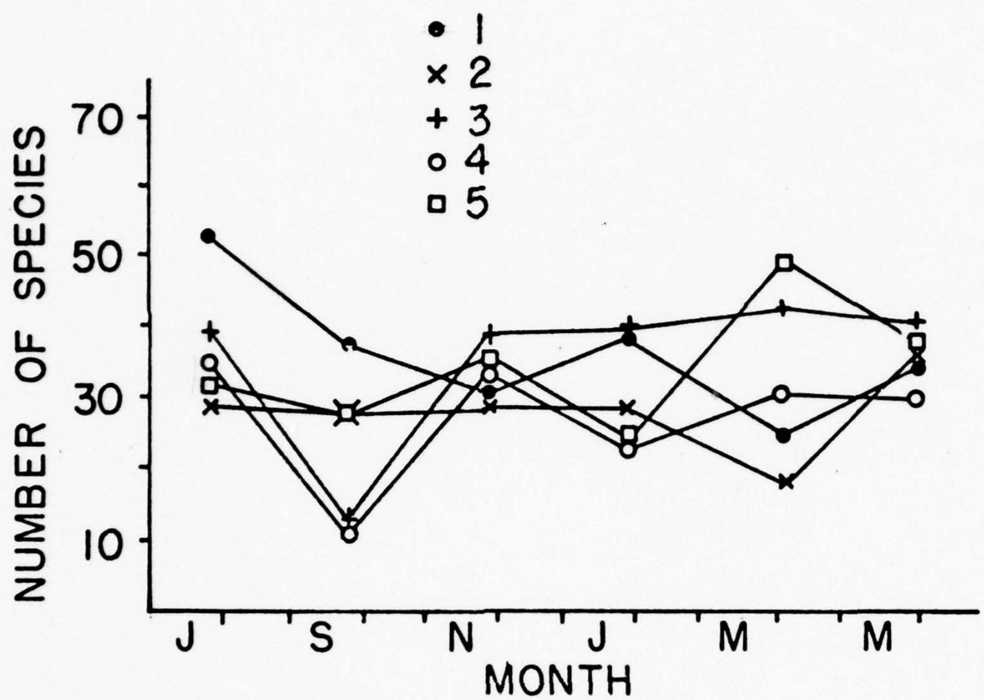


Figure 50. Temporal changes in benthic diversity at stations in block 14

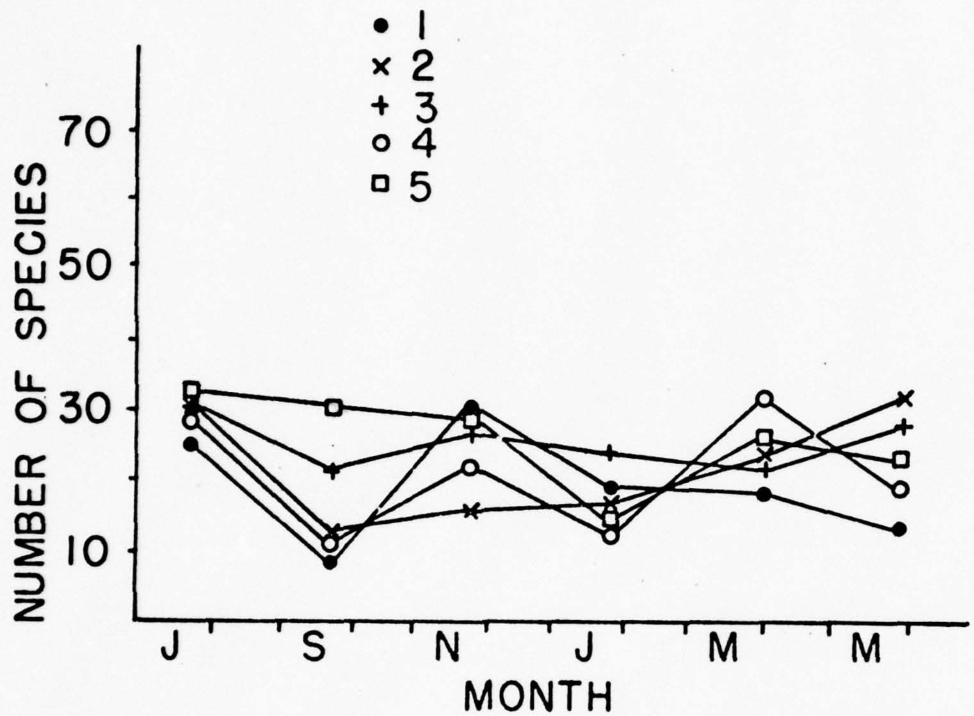


Figure 51. Temporal changes in benthic diversity at stations in block 27

** RUN # 1 **

NORMAL ANALYSIS, JULY 1975 THRU MAY 1976 COMB.

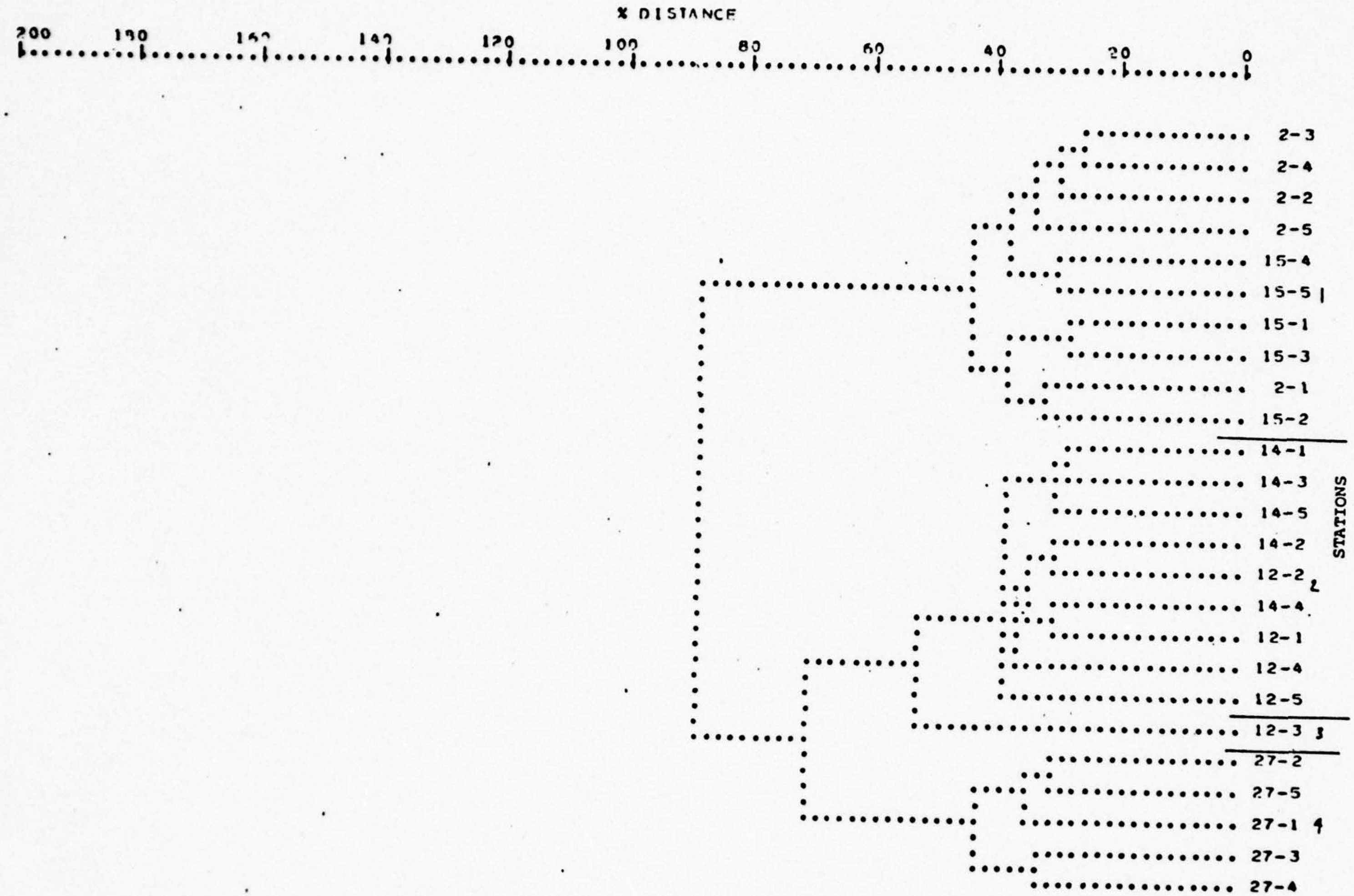


Figure 52. Site group dendrogram, July-May benthic data

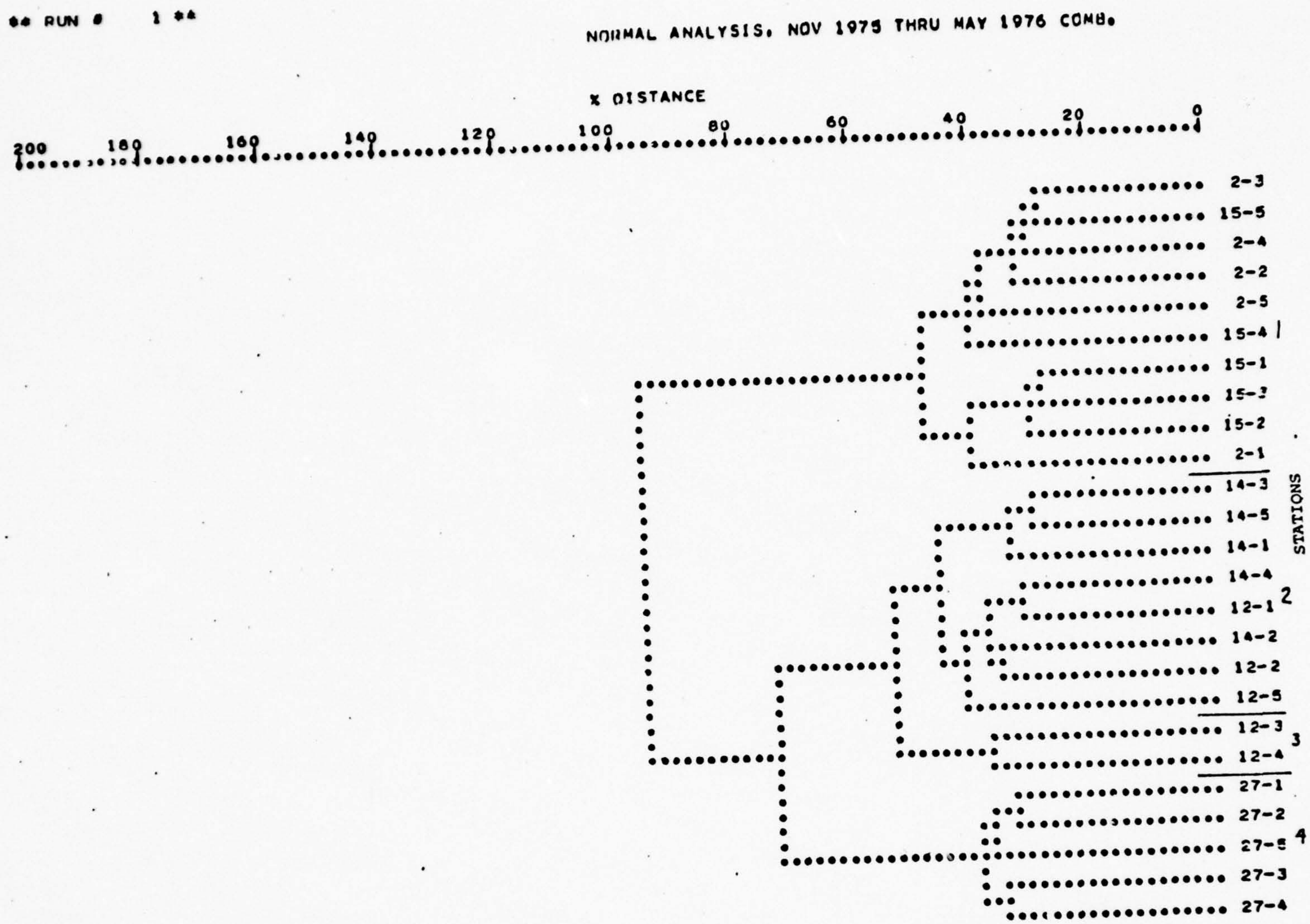


Figure 53. Site group dendrogram, November-May benthic data

** RUN #   1 **

NORMAL ANALYSIS. JAN. MAR. MAY 1976 CCMB.

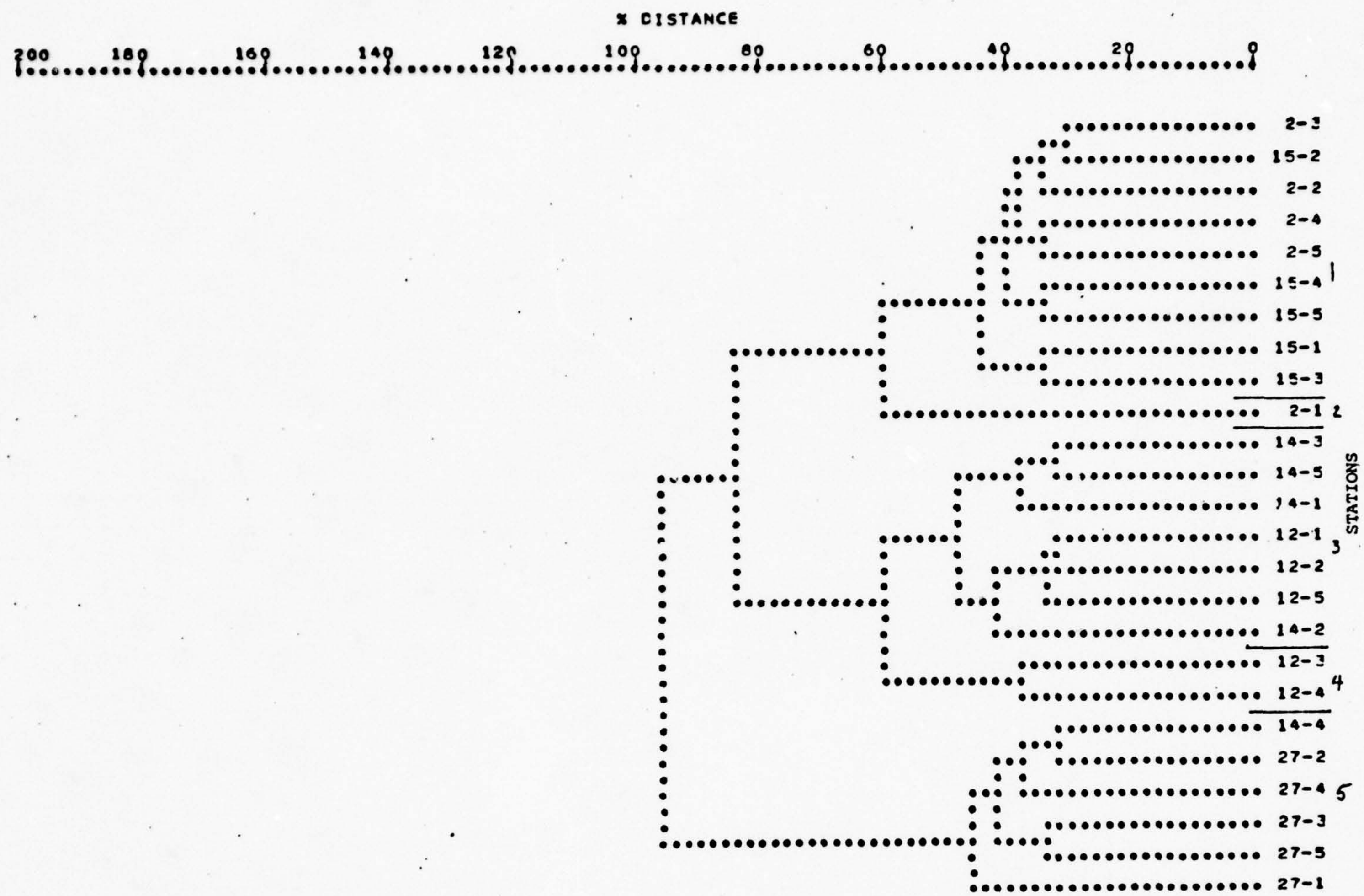


Figure 54. Site group dendrogram, January-May benthic data

** RUN # 1 **

JANUARY,1976 COLLECTION * BIOTIC DATA

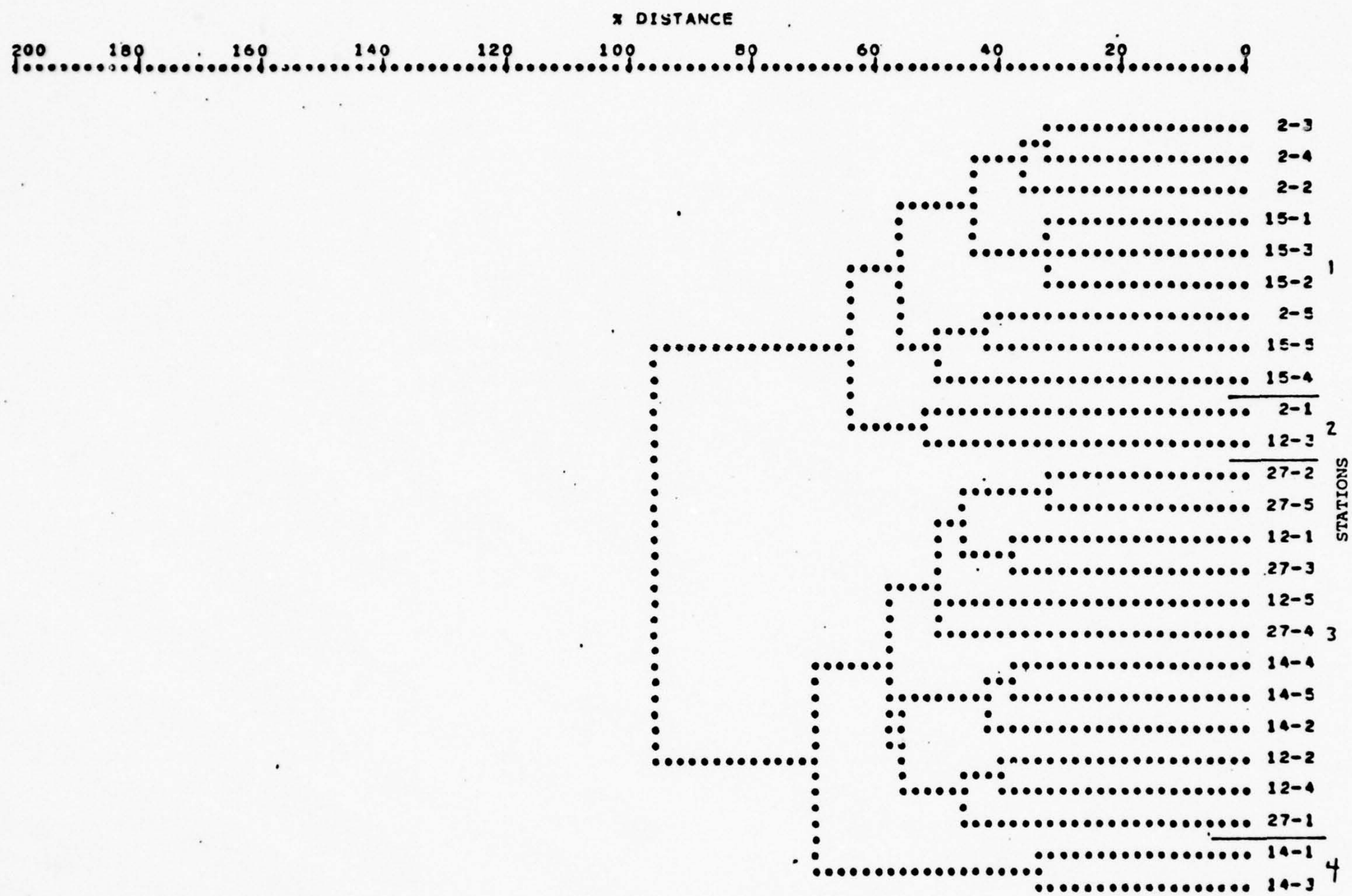


Figure 55. Site group dendrogram, November-January benthic data

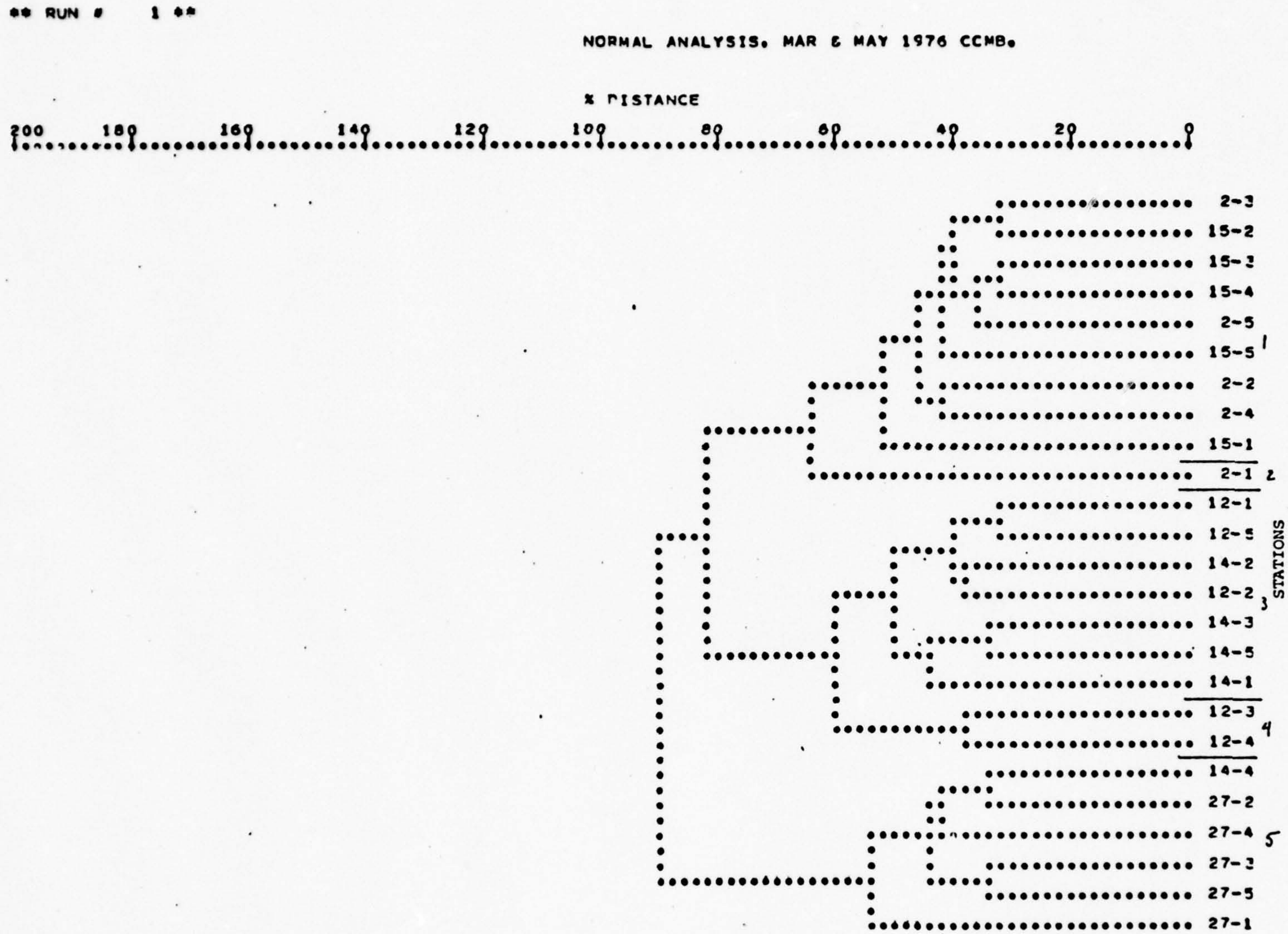


Figure 56. Site group dendrogram, March-May benthic data

** RUN # 1 **

NORMAL ANALYSIS (REP SUM), JULY 1975

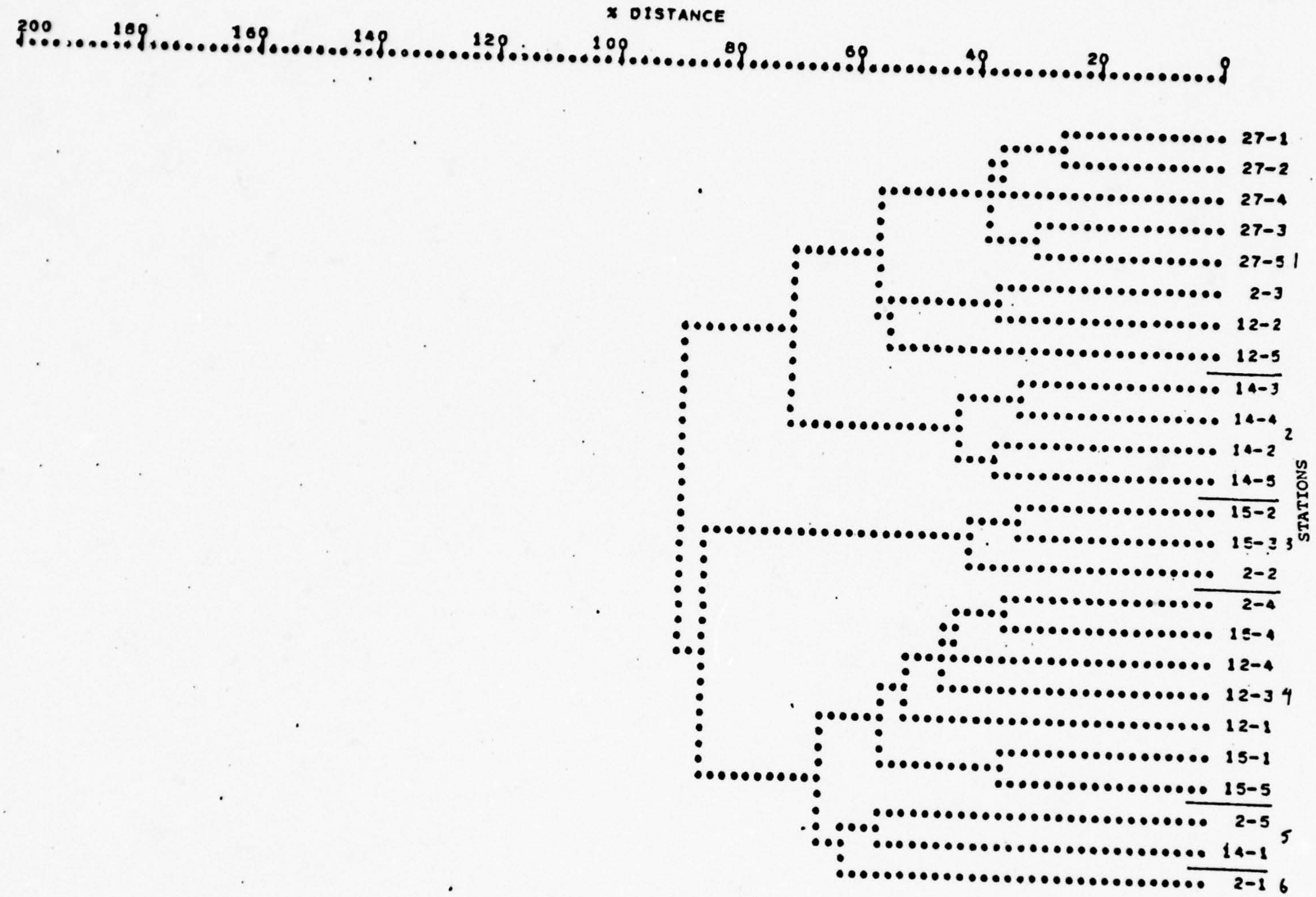


Figure 57. Site group dendrogram, July benthic data

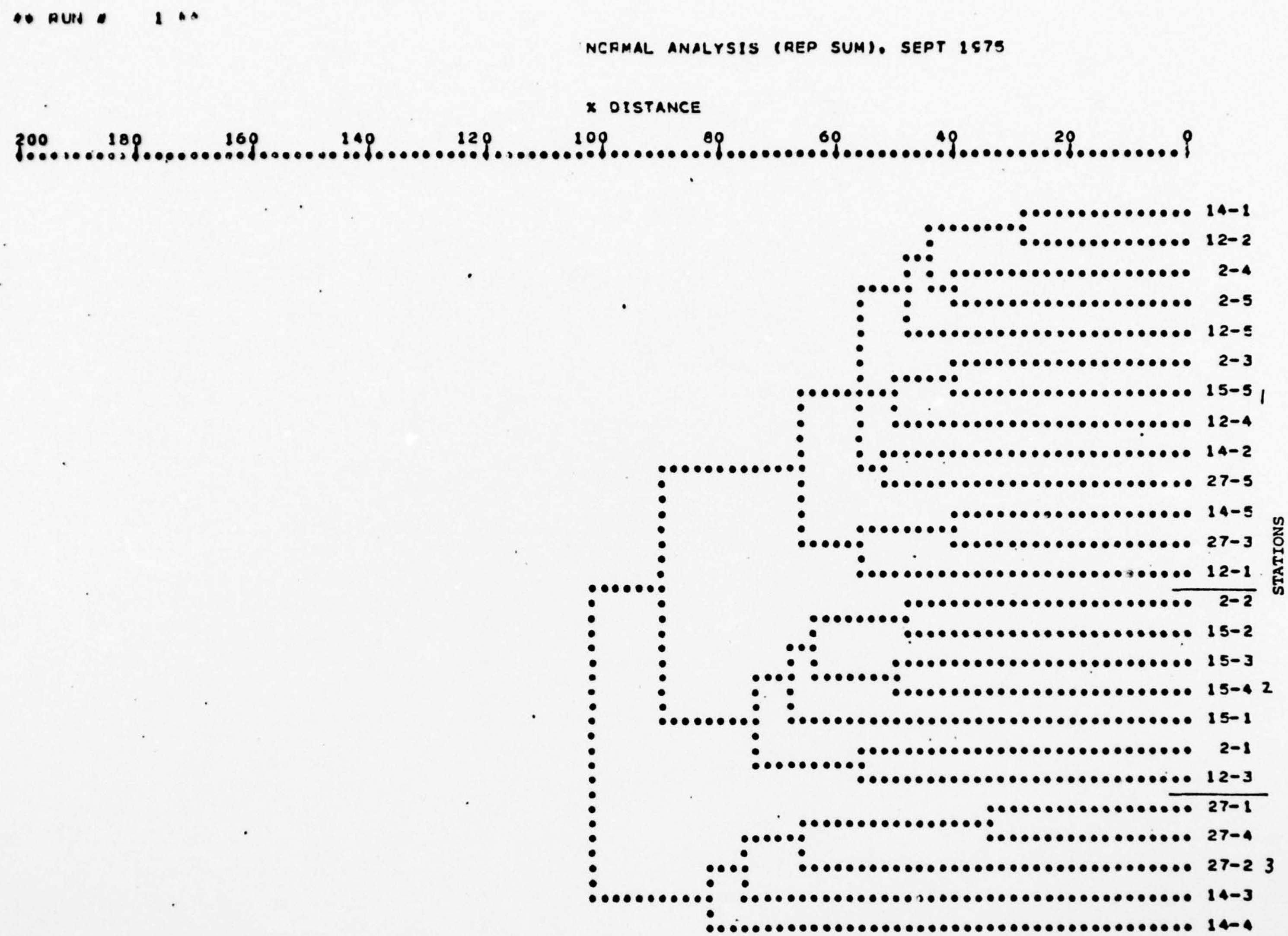


Figure 58. Site group dendrogram, September benthic data

** RUN # 1 **

NORMAL ANALYSIS (REP SUM), NOV 1975

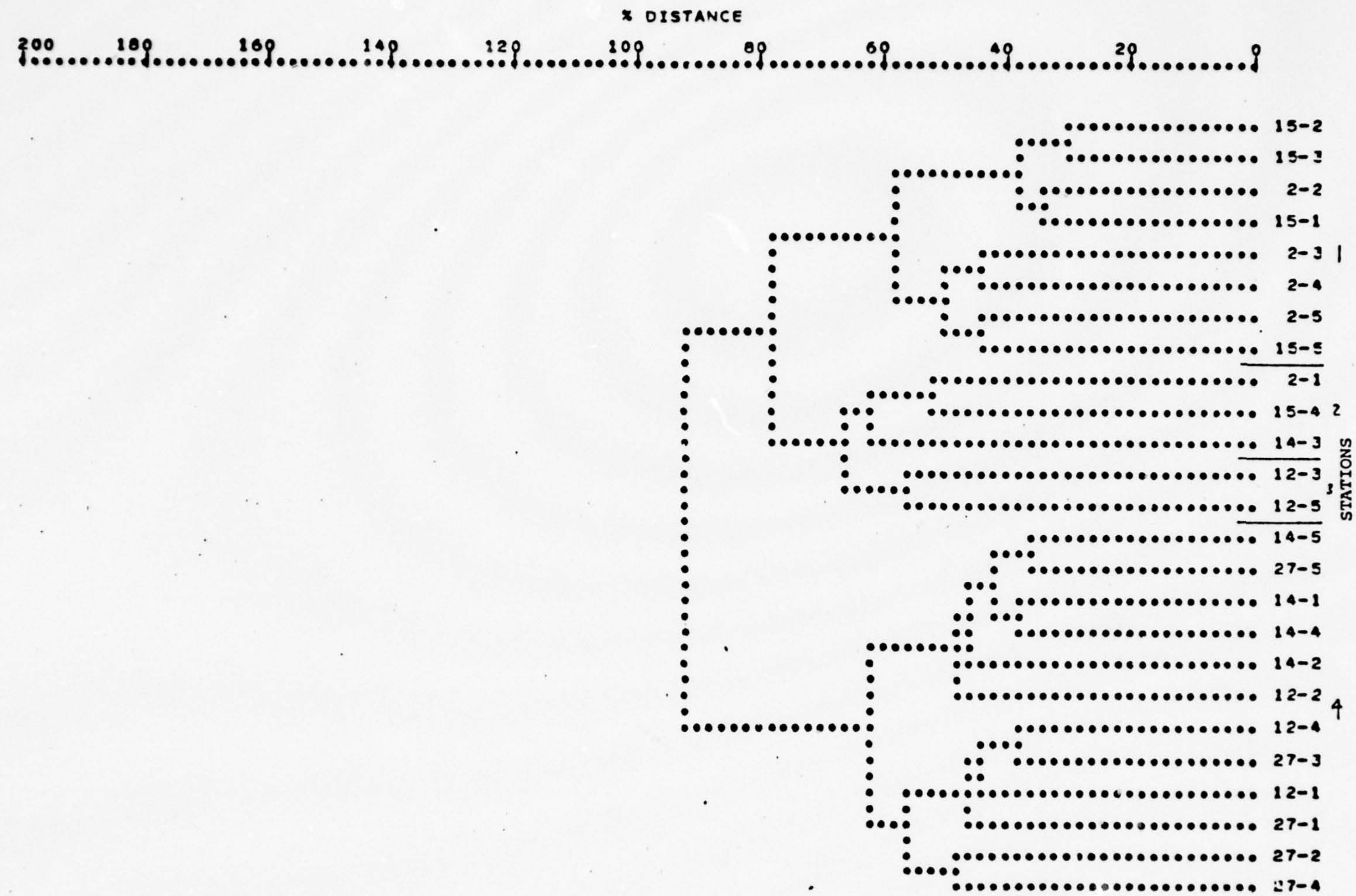


Figure 59. Site group dendrogram, November benthic data

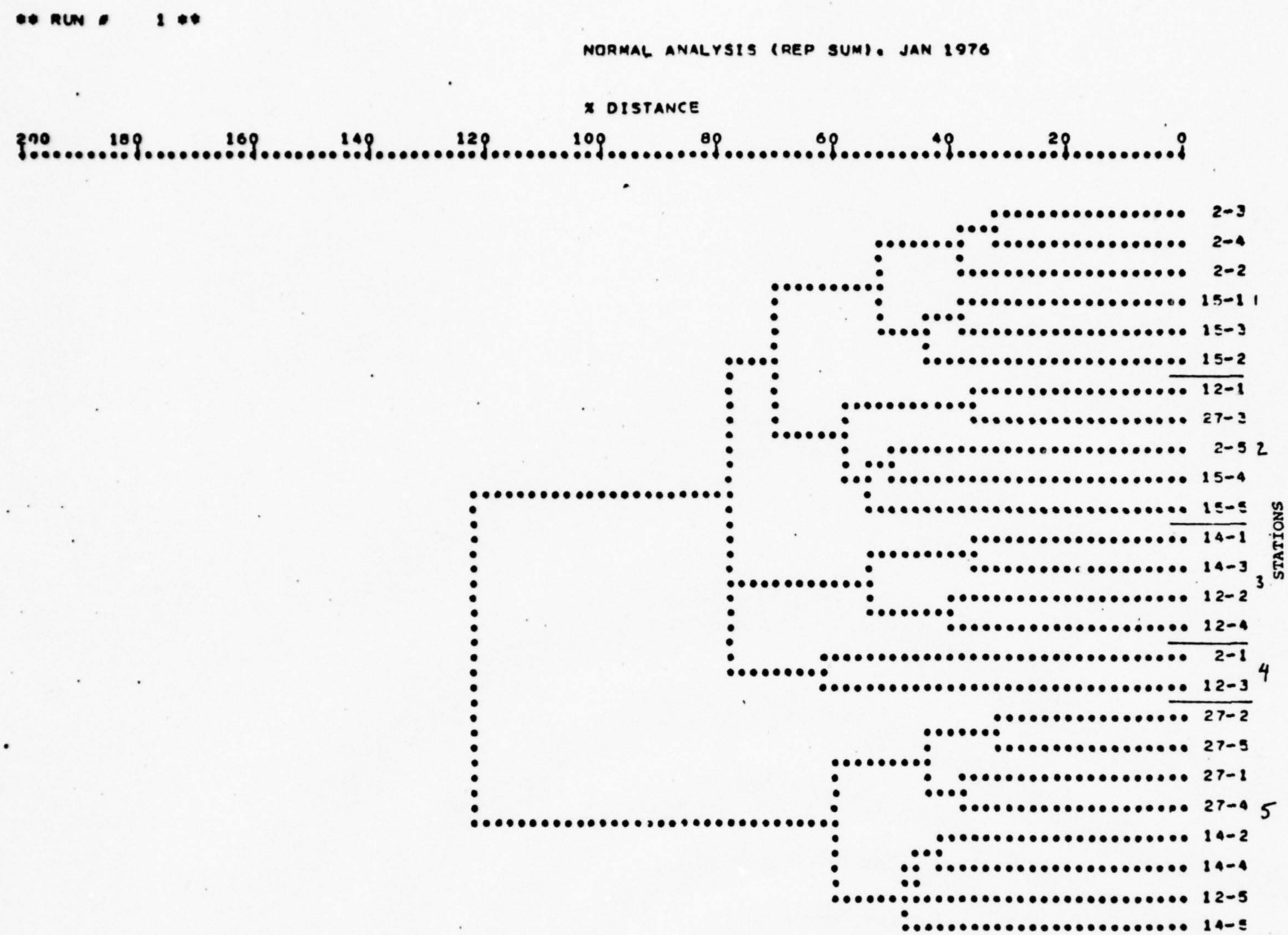


Figure 60. Site group dendrogram, January benthic data

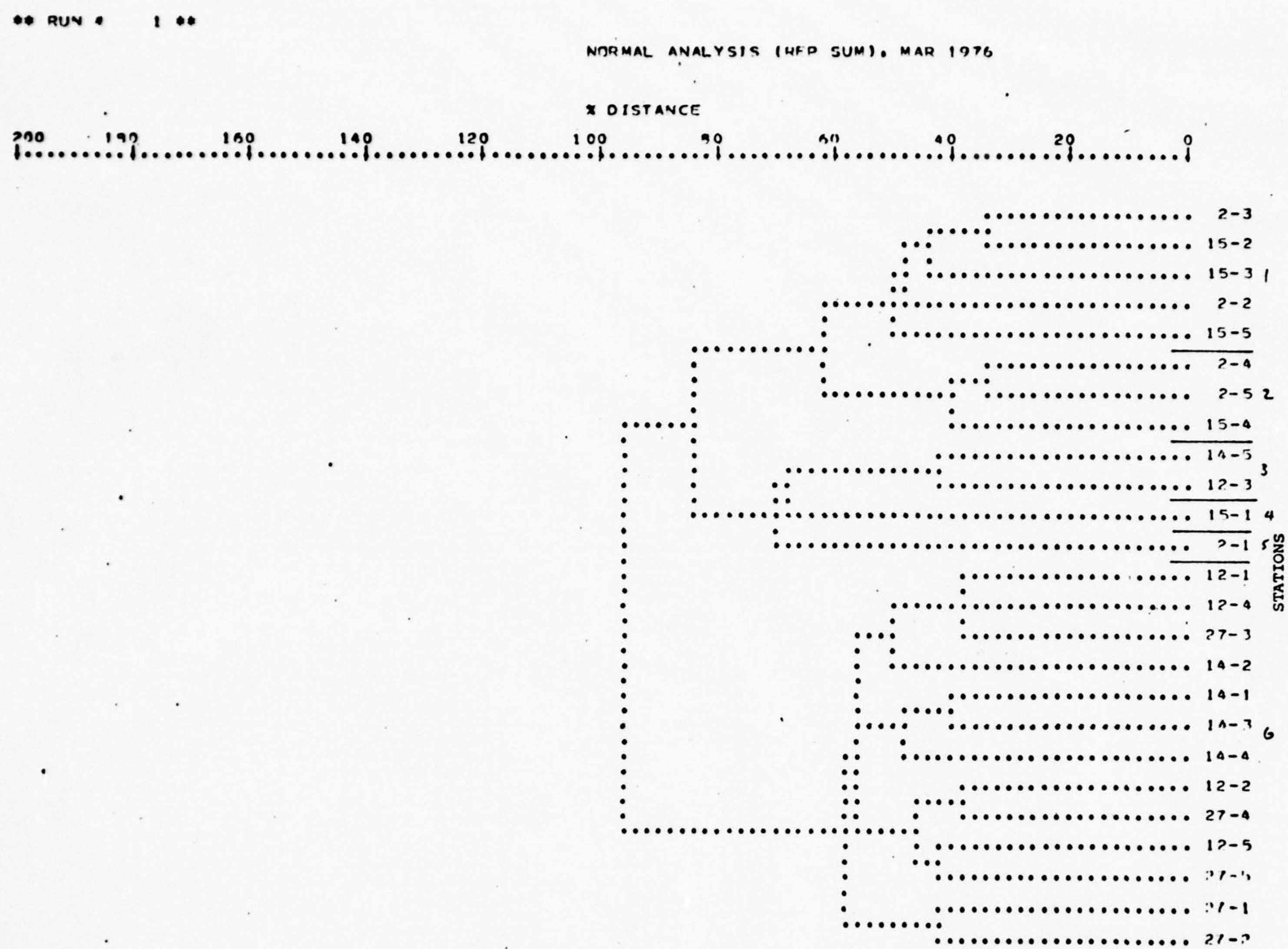


Figure 61. Site group dendrogram, March benthic data

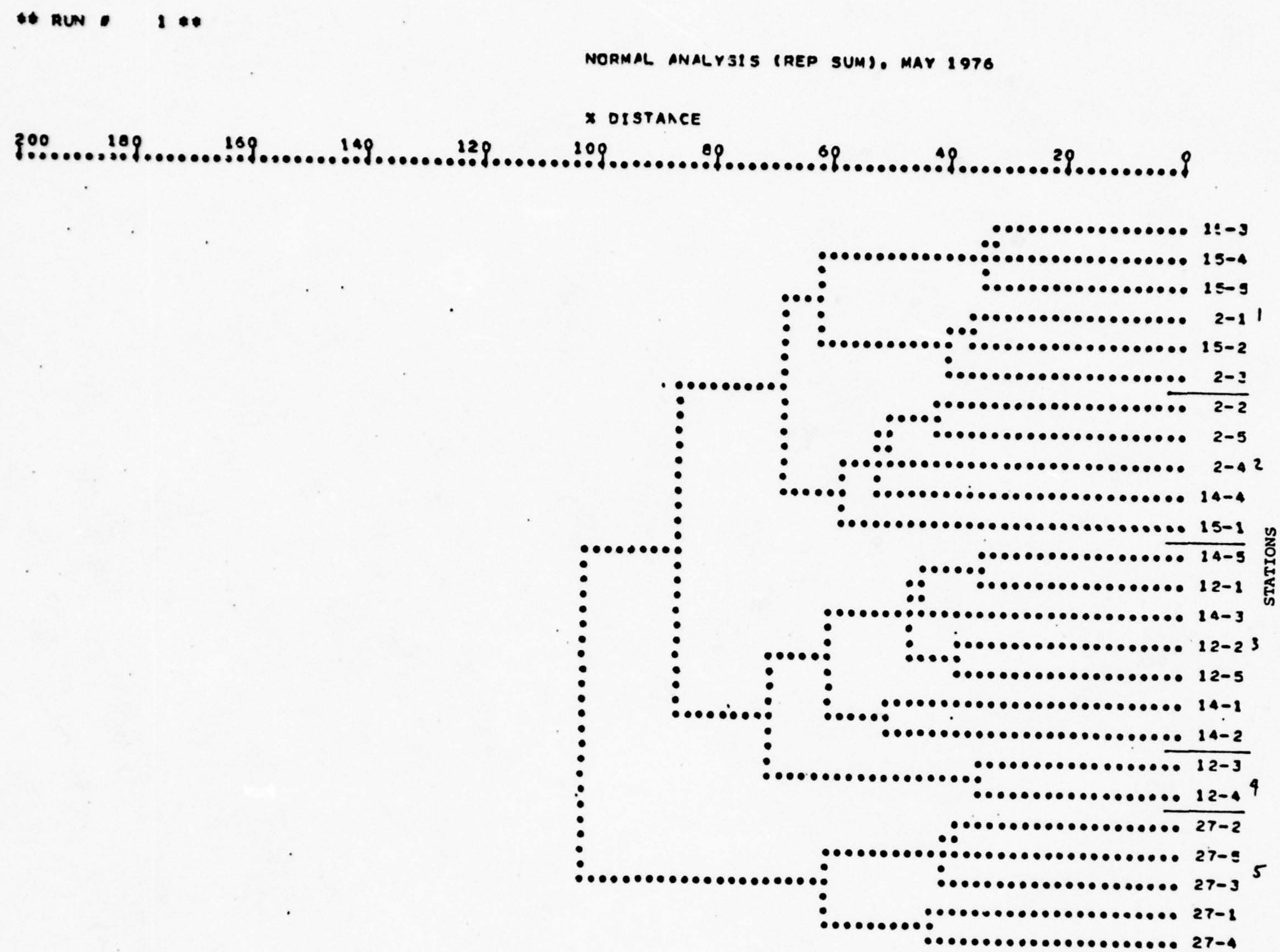


Figure 62. Site group dendrogram, May benthic data

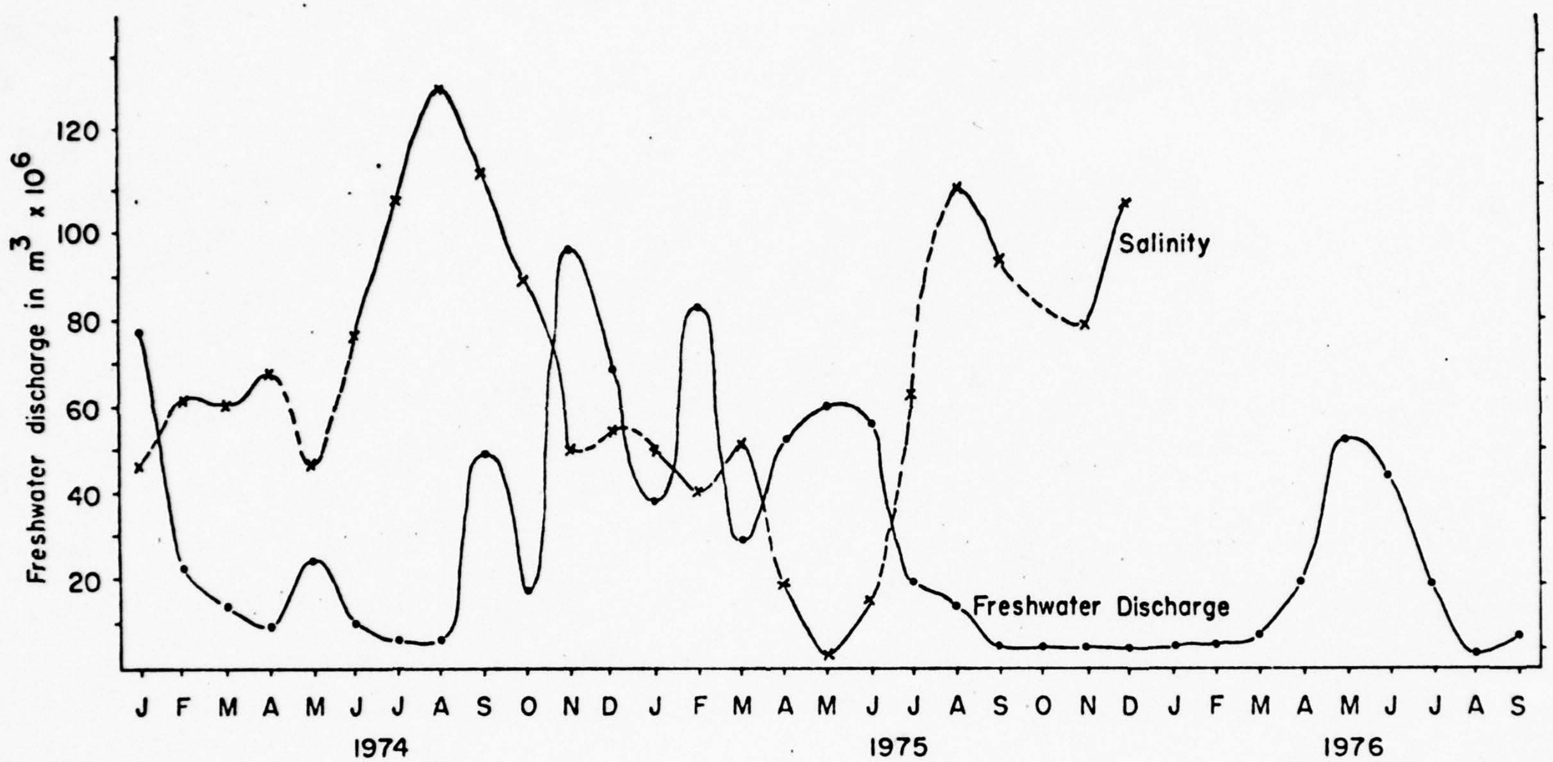


Figure 63. Comparison of the Galveston Channel salinities and the freshwater discharge into Galveston Bay, 1974-1976

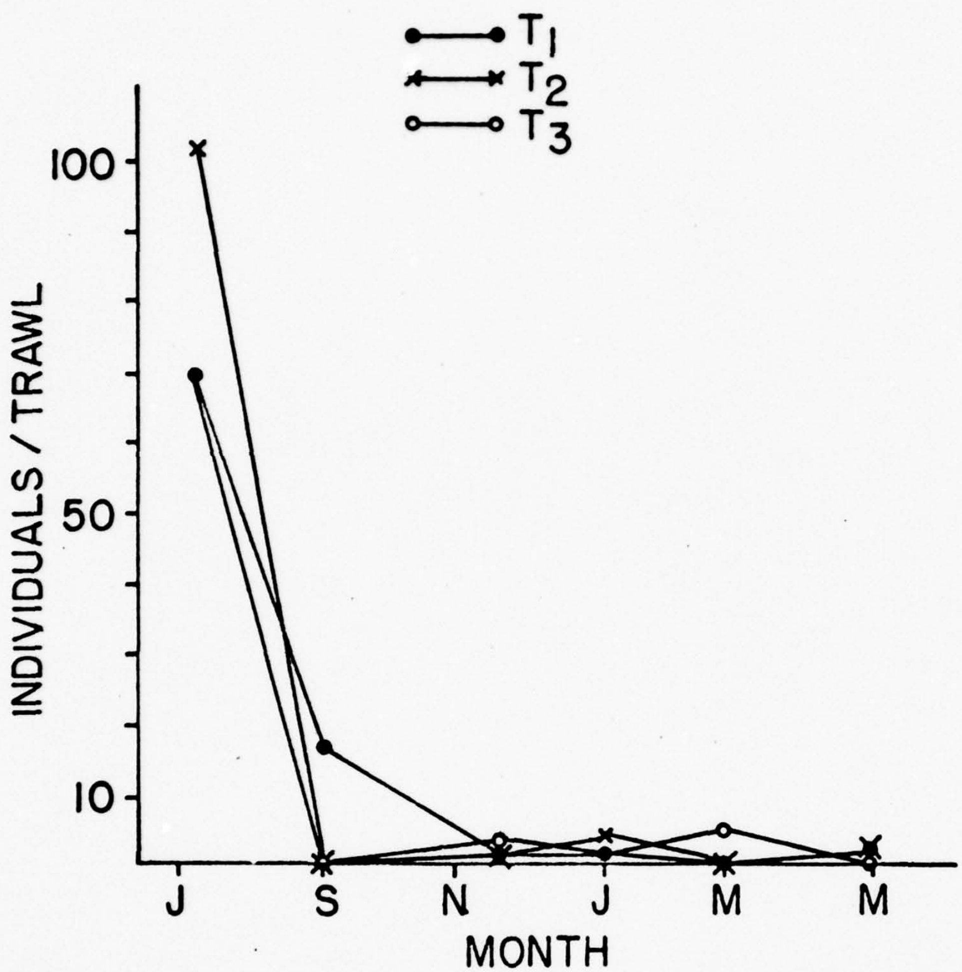


Figure 64. Temporal changes in benthic macroinvertebrate populations at block 2 trawl stations

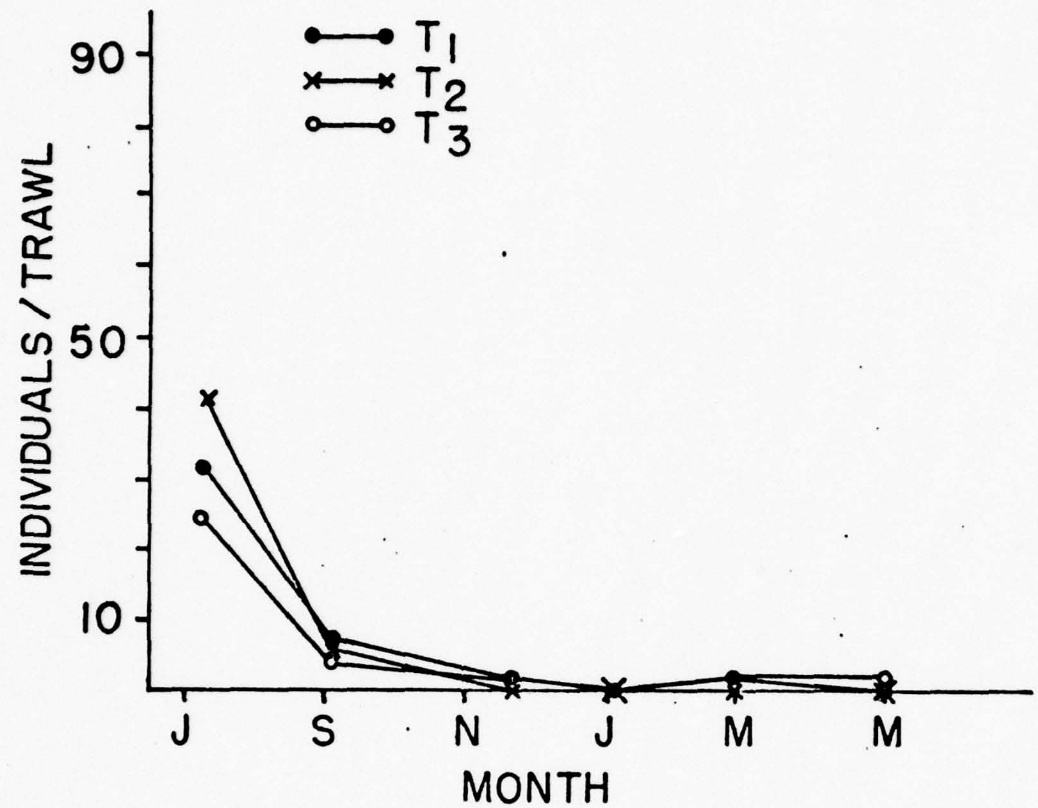


Figure 65. Temporal changes in benthic macroinvertebrate populations at block 15 trawl stations

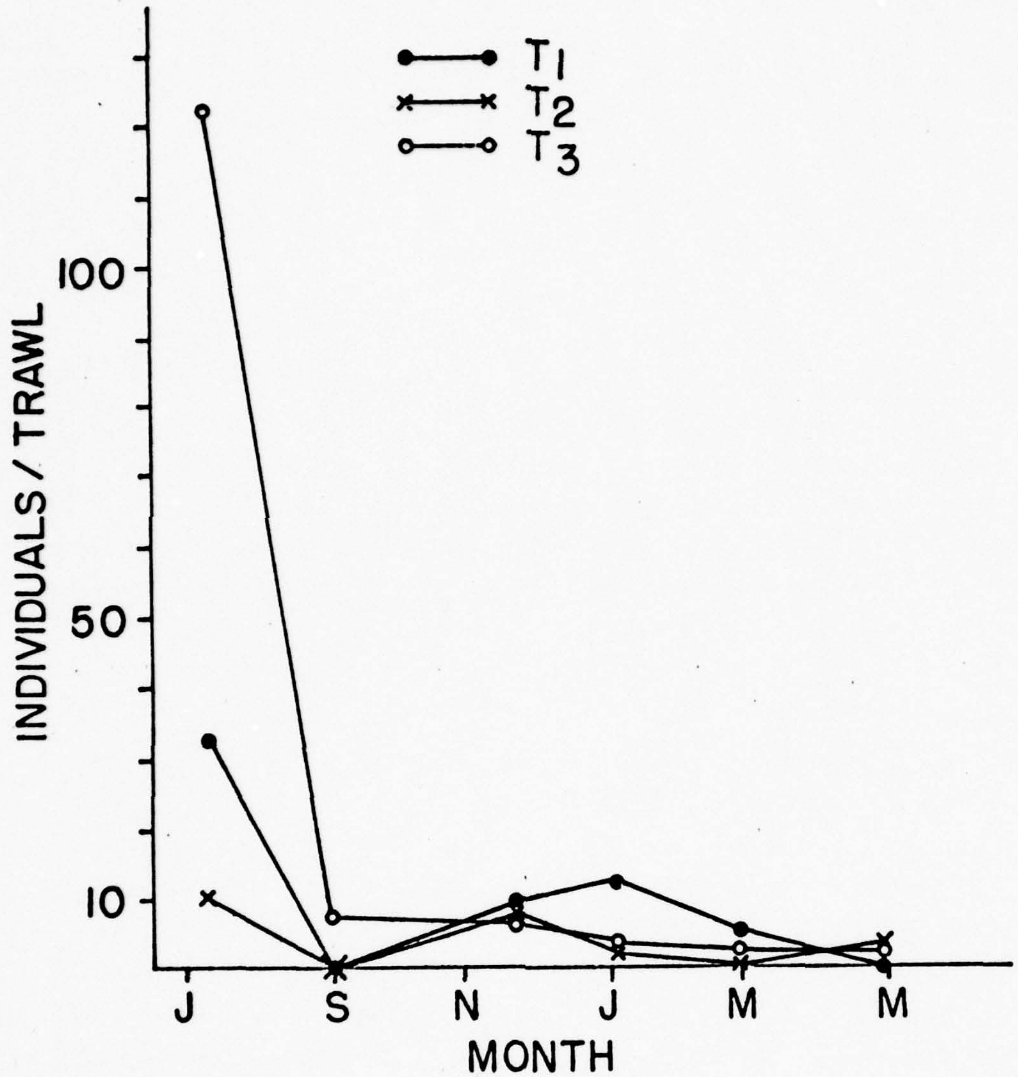


Figure 66. Temporal changes in benthic macroinvertebrate populations at block 12 trawl stations

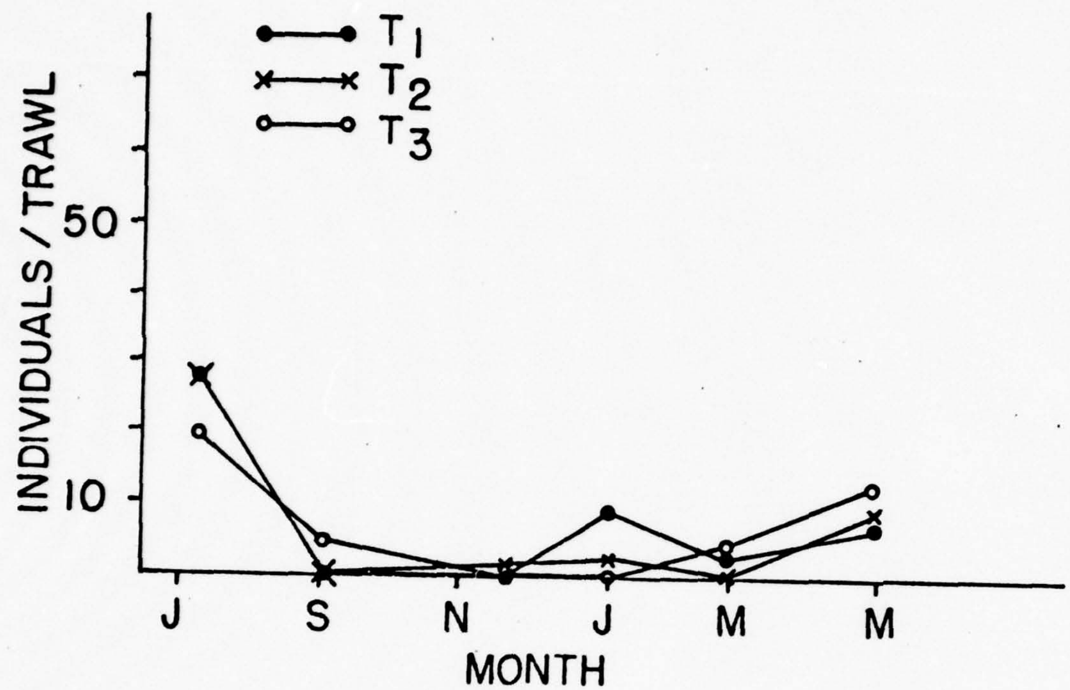


Figure 67. Temporal changes in benthic macroinvertebrate populations at block 14 trawl stations

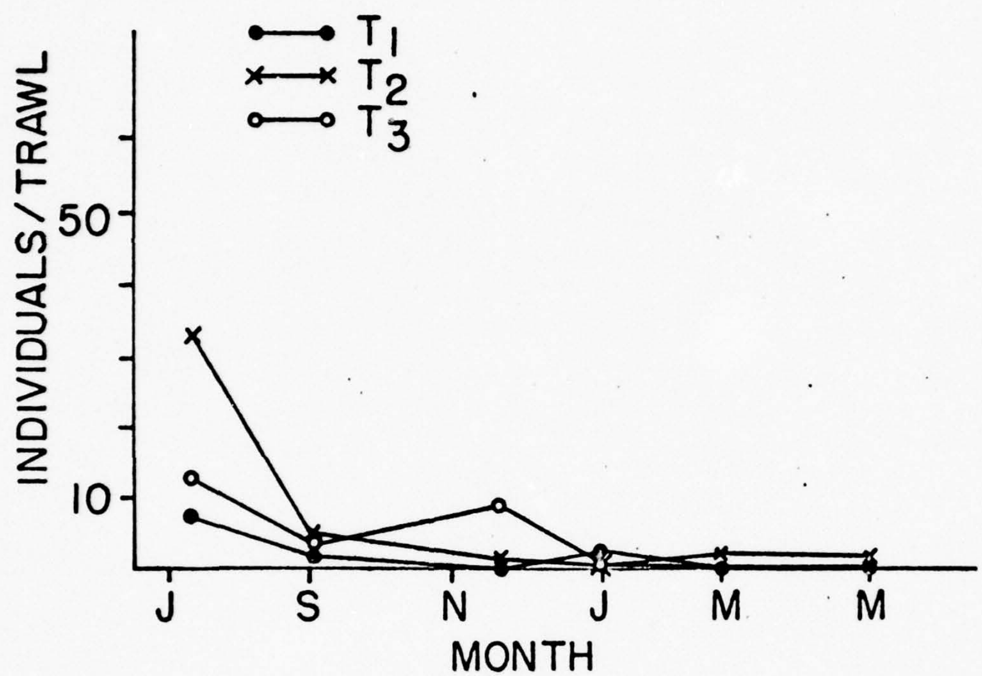


Figure 68. Temporal changes in benthic macroinvertebrate populations at block 27 trawl stations

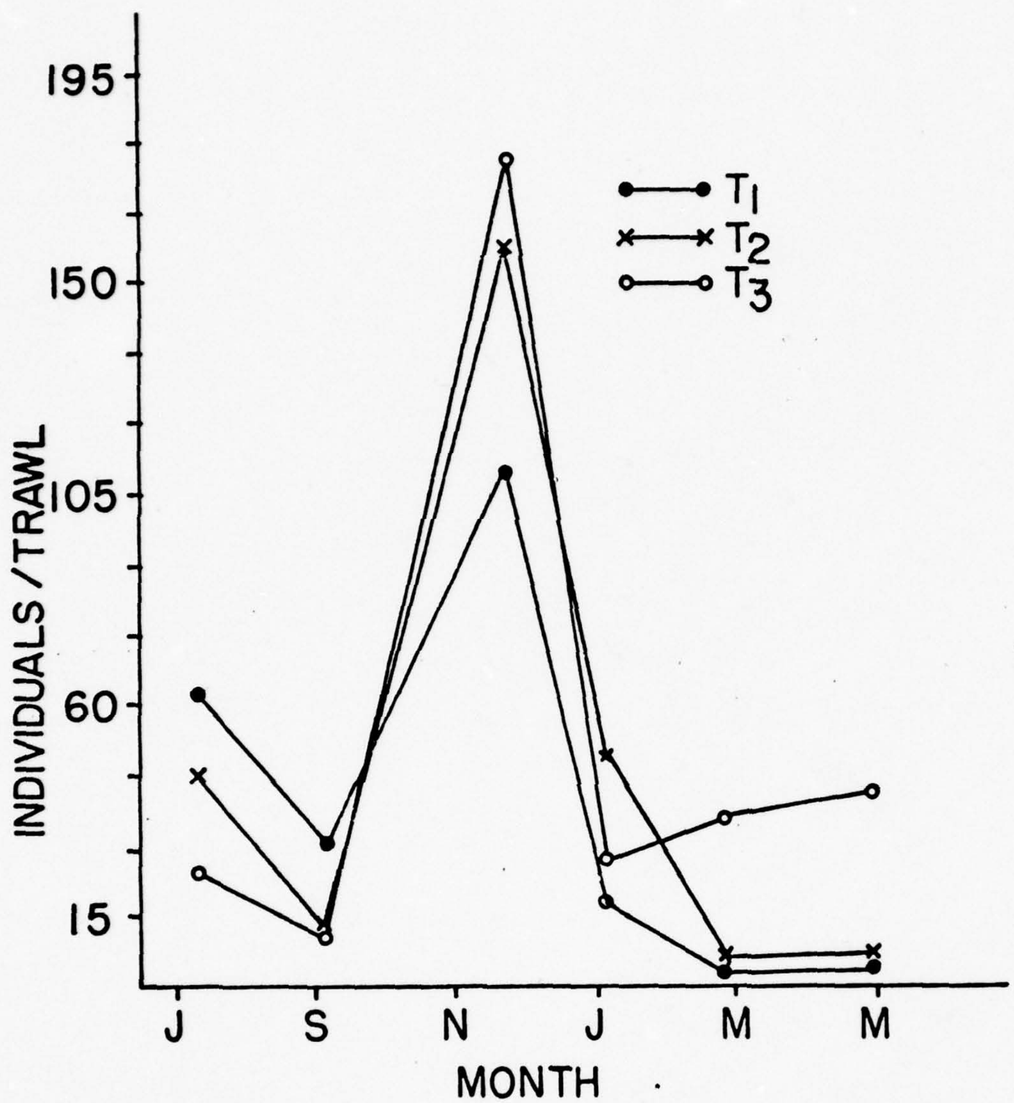


Figure 69. Temporal changes in nektonic invertebrate populations at block 2 trawl stations

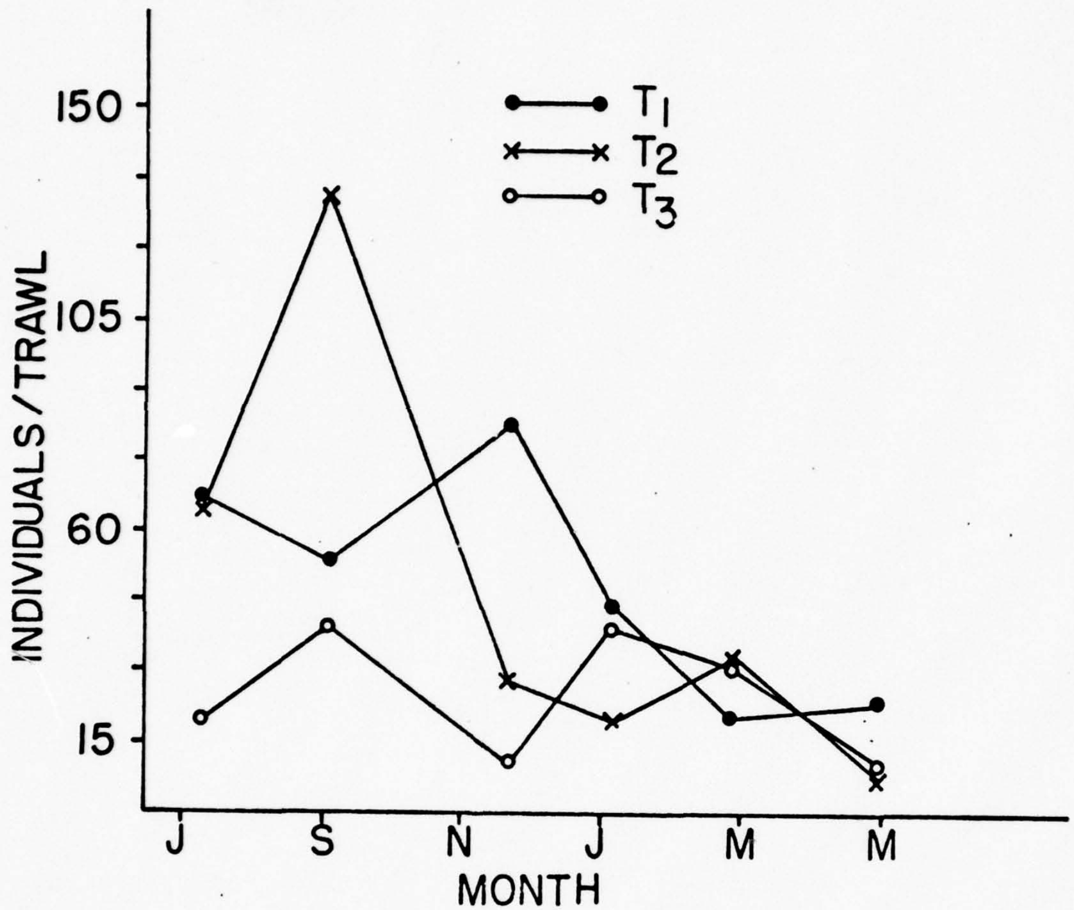


Figure 70. Temporal changes in nektonic invertebrate populations at block 15 trawl stations

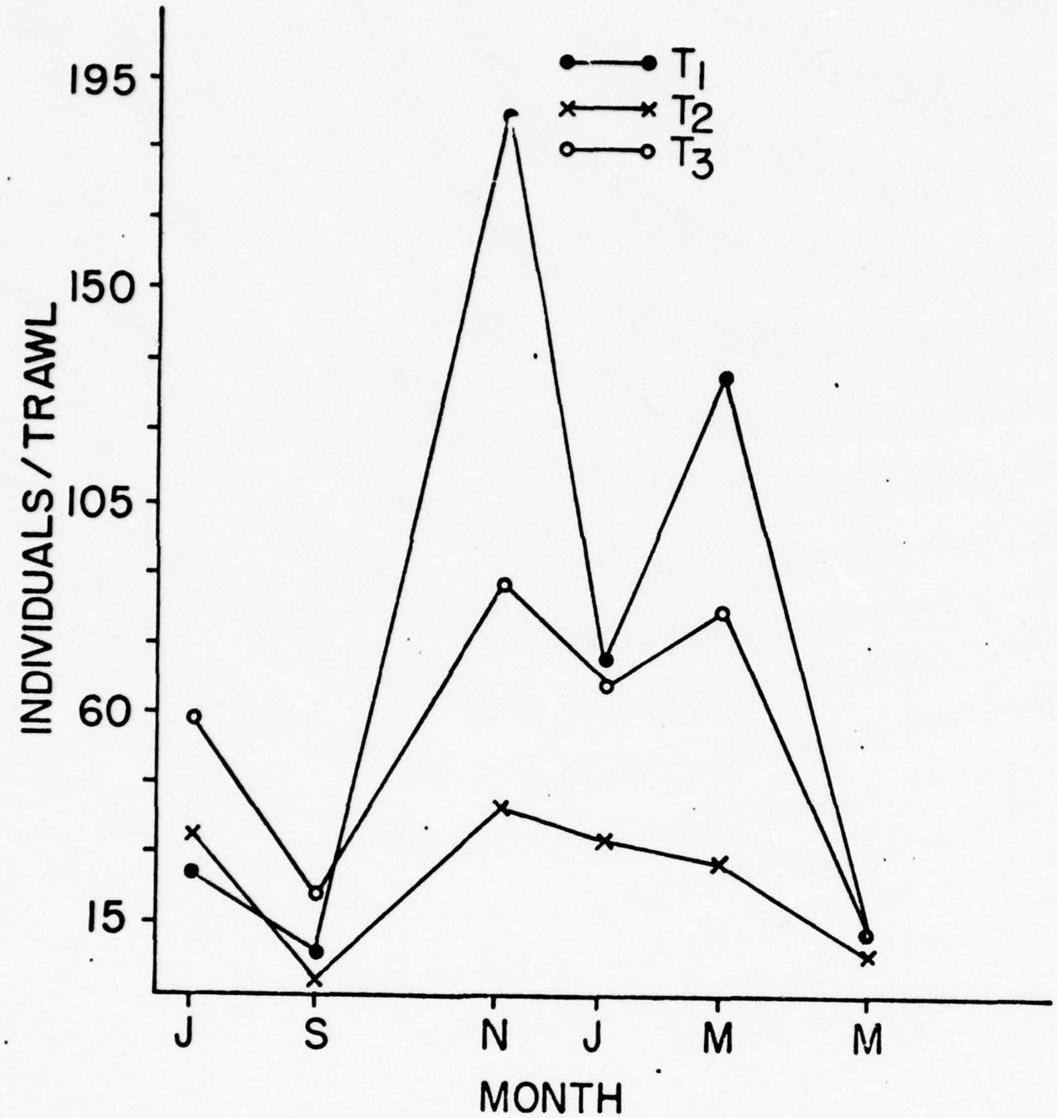


Figure 71. Temporal changes in nektonic invertebrate populations at block 12 trawl stations

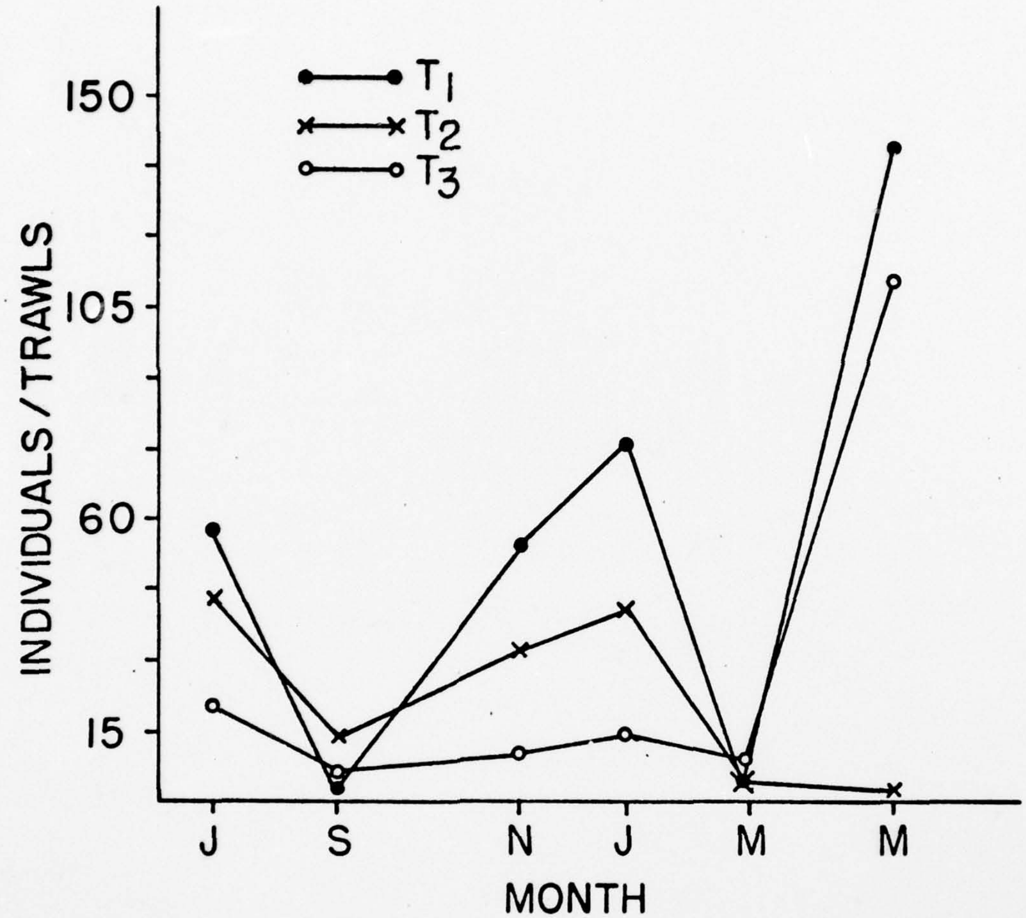


Figure 72. Temporal changes in nektonic invertebrate populations at block 14 trawl stations

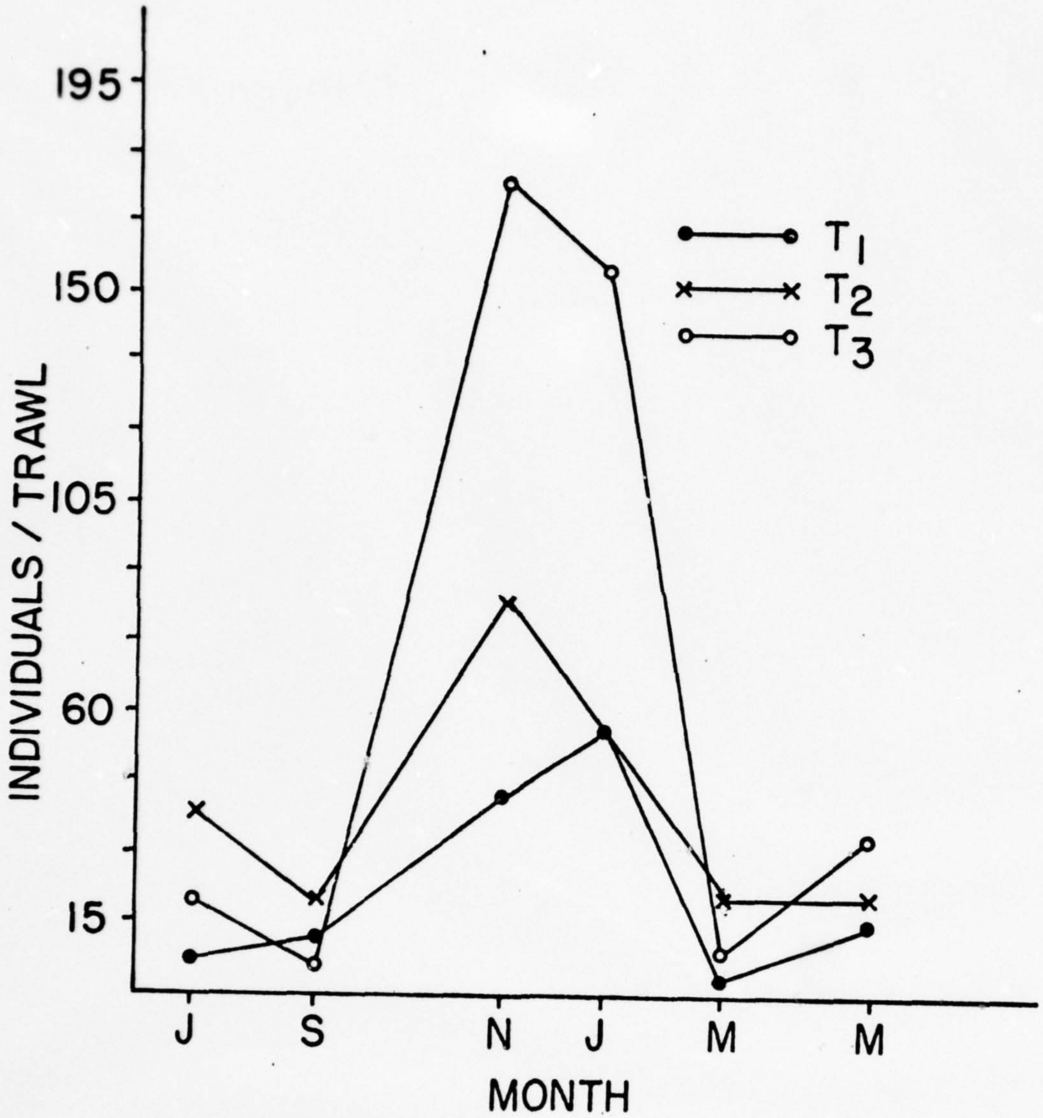


Figure 73. Temporal changes in nektonic invertebrate populations at block 27 trawl stations

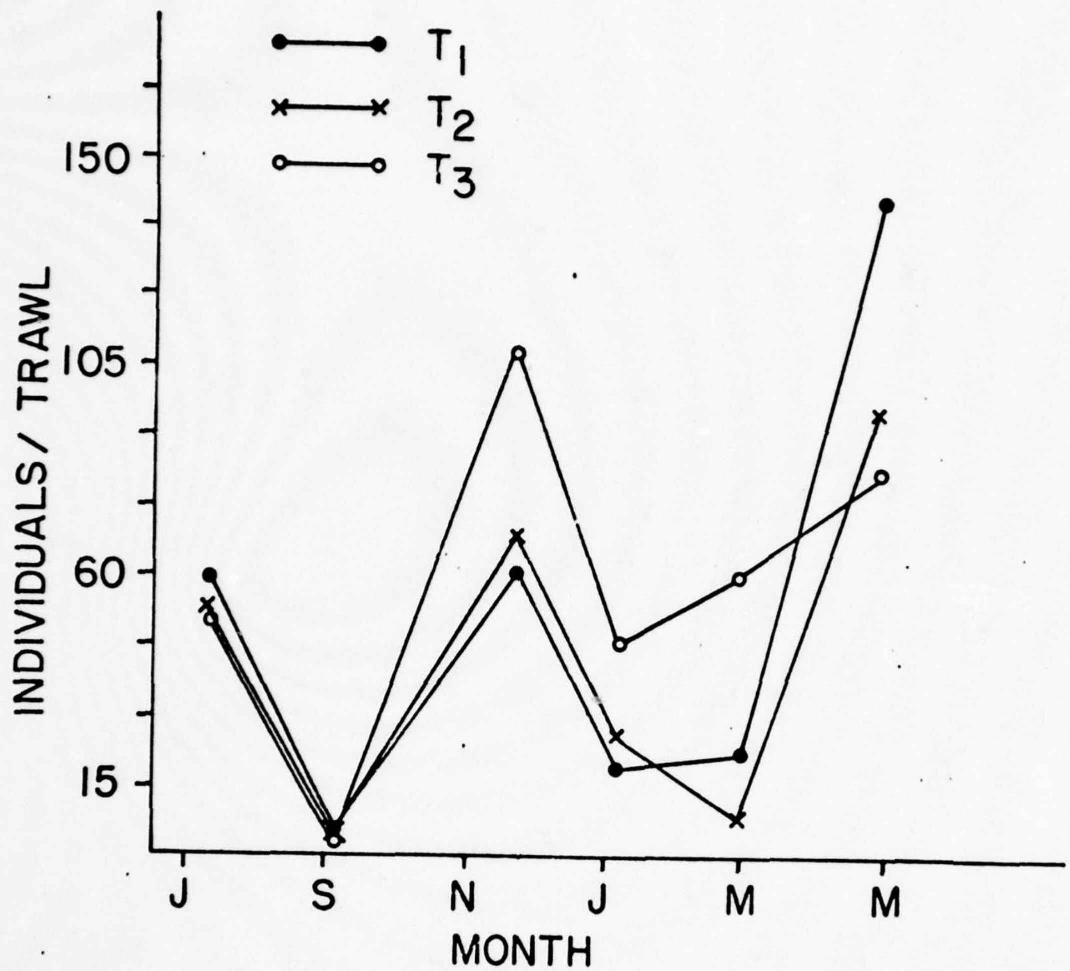


Figure 74. Temporal changes in fish populations at block 2 trawl stations

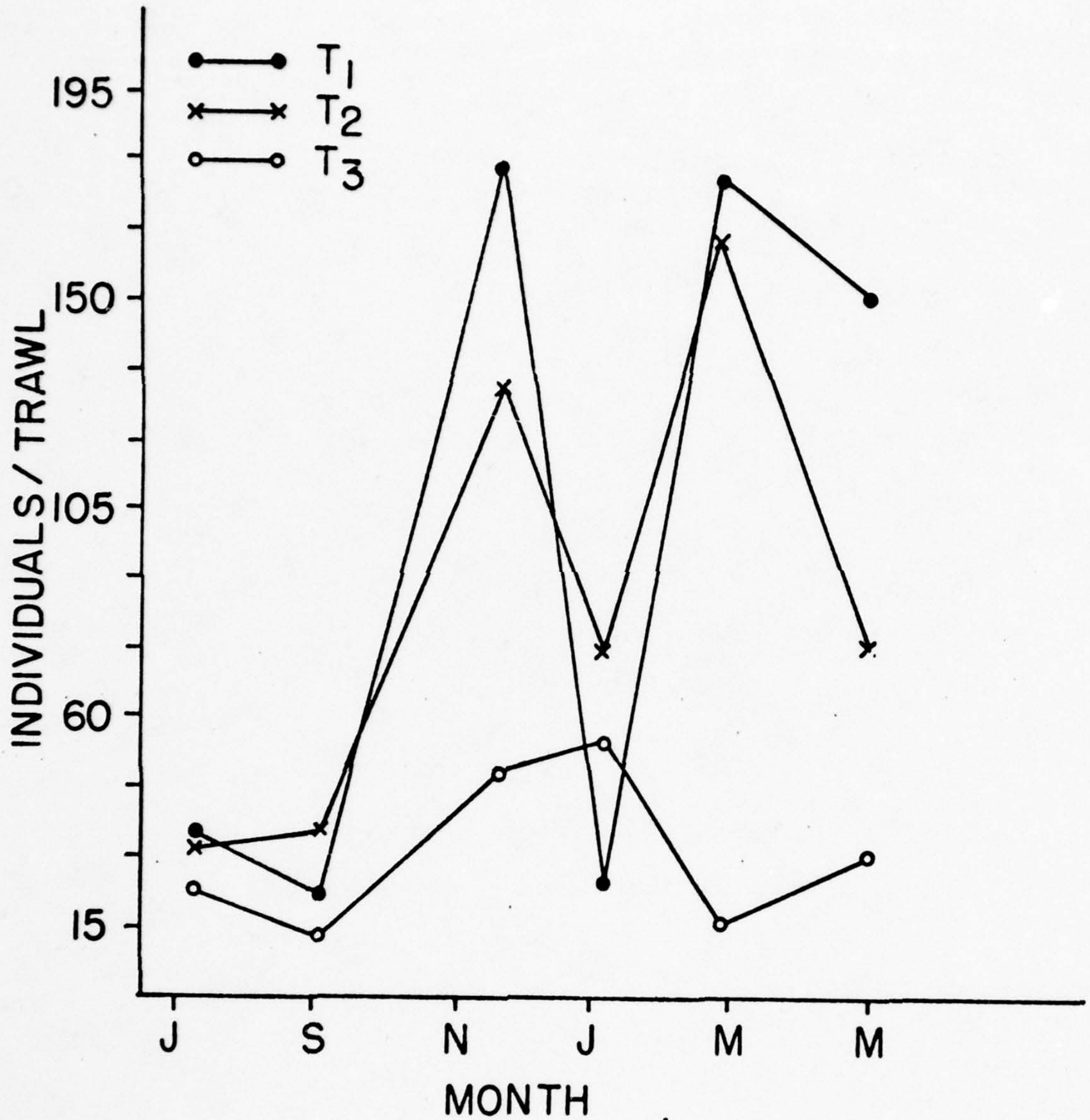


Figure 75. Temporal changes in fish populations at block 15 trawl stations

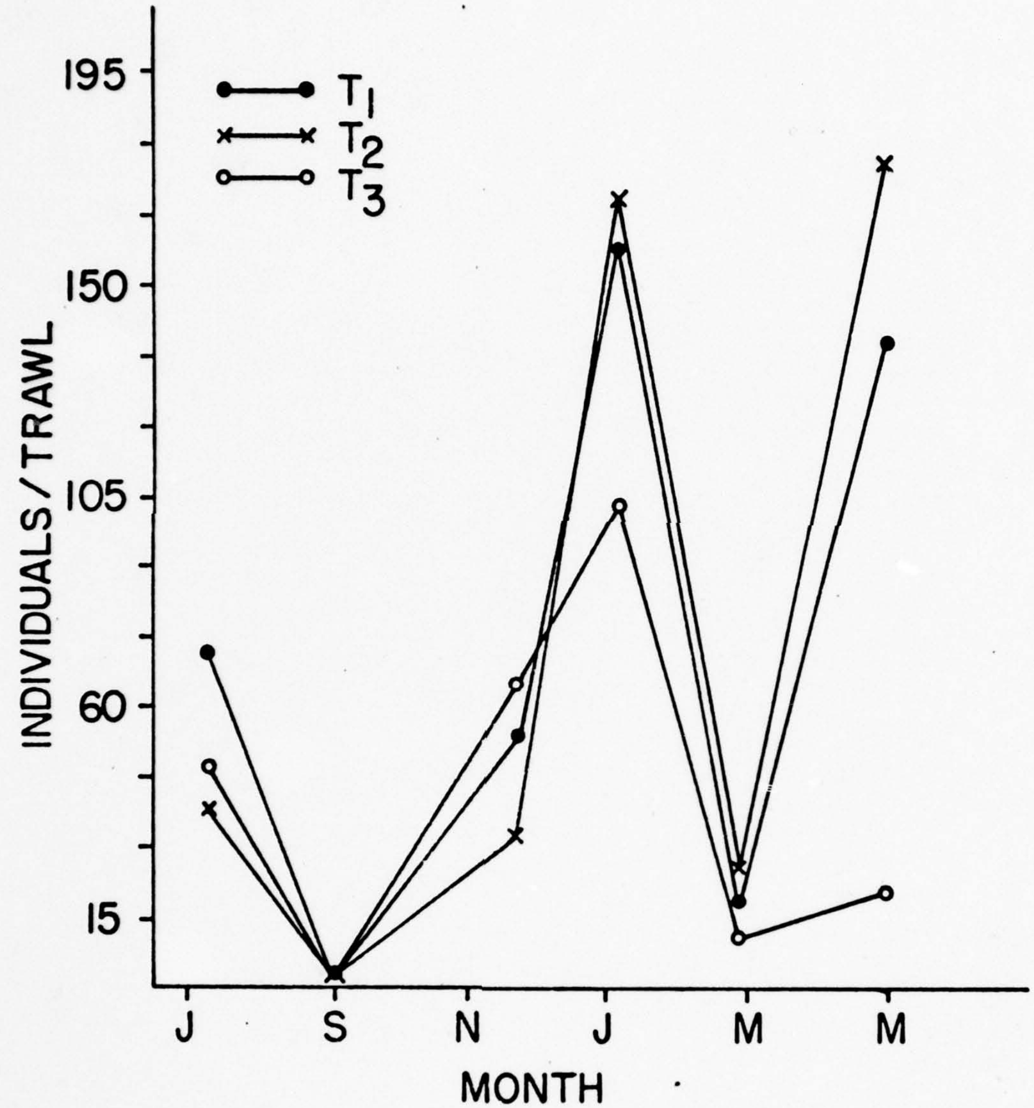


Figure 76. Temporal changes in fish populations at block 12 trawl stations

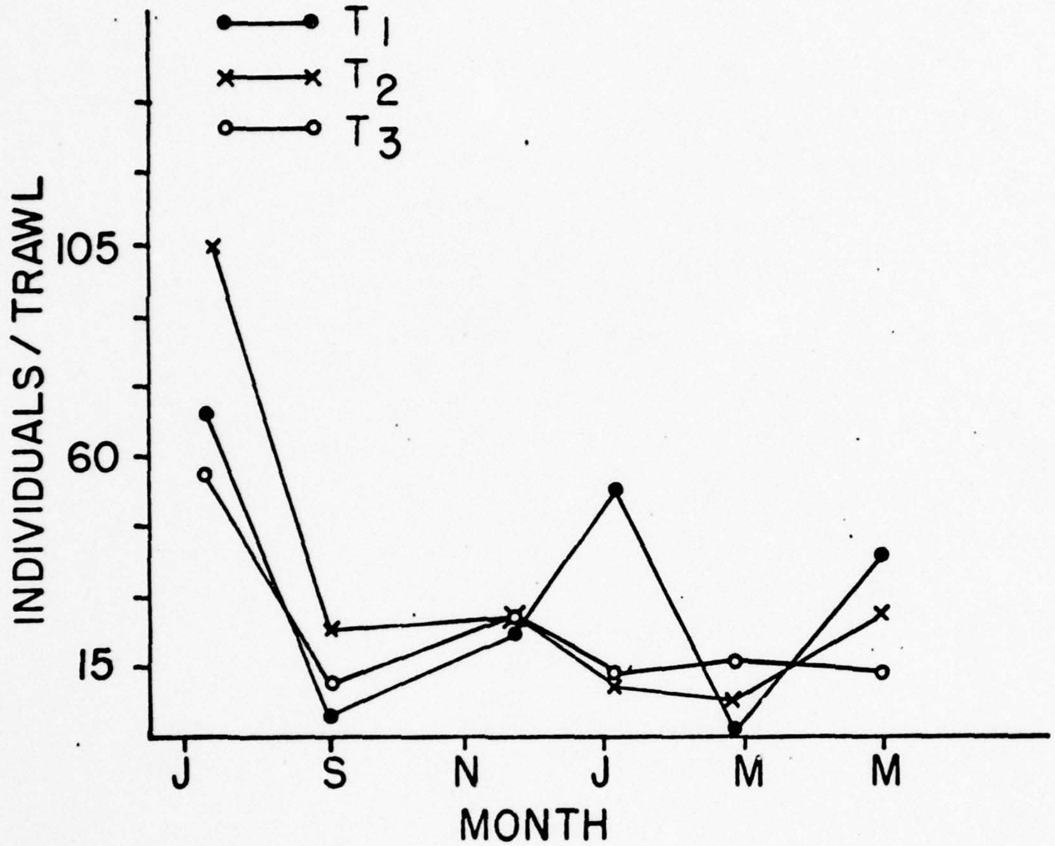


Figure 77. Temporal changes in fish populations at block 14 trawl stations

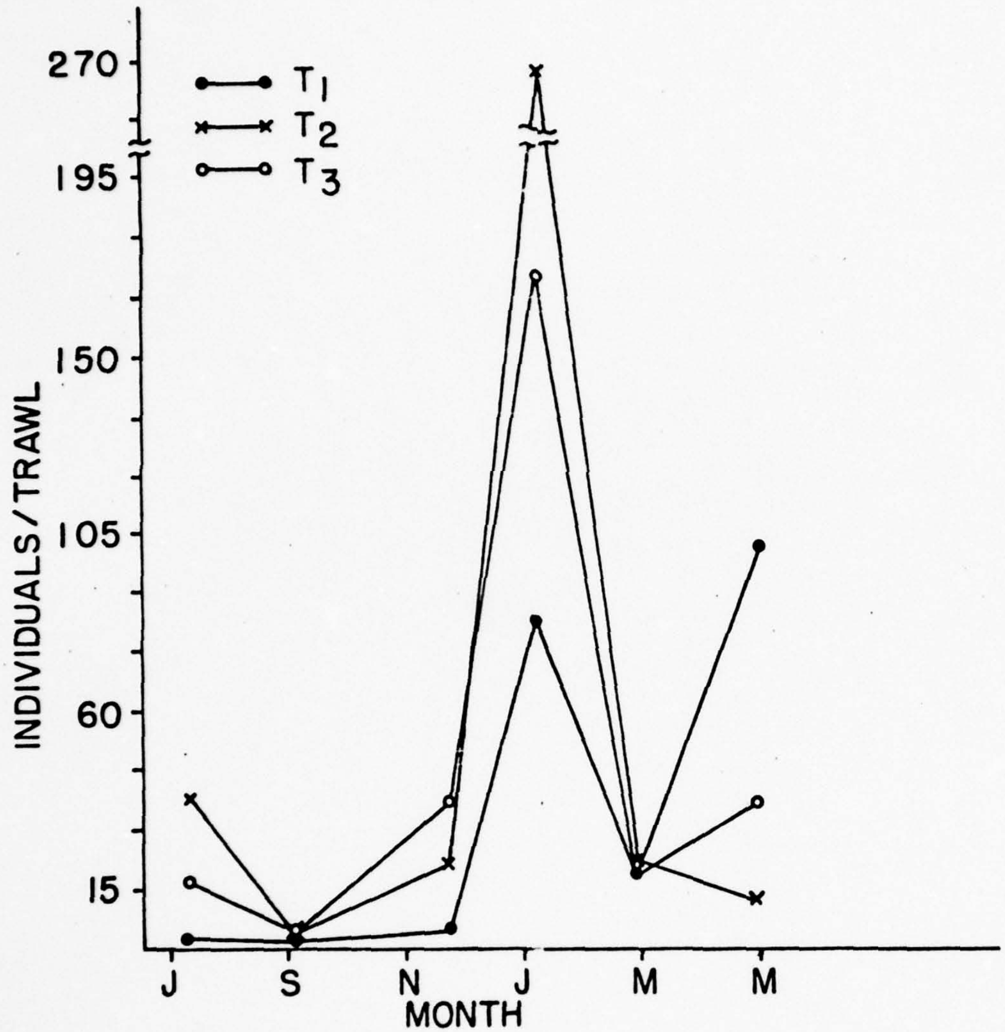


Figure 78. Temporal changes in fish populations at block 27 trawl stations

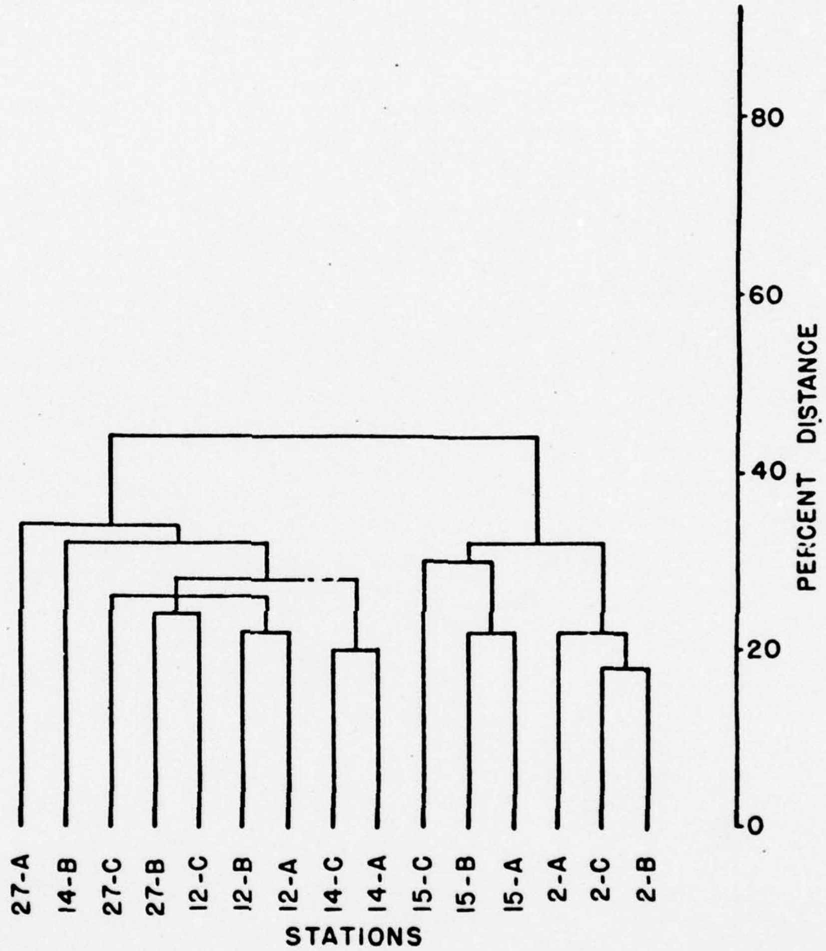


Figure 79. Site group dendrogram, July-May nekton data

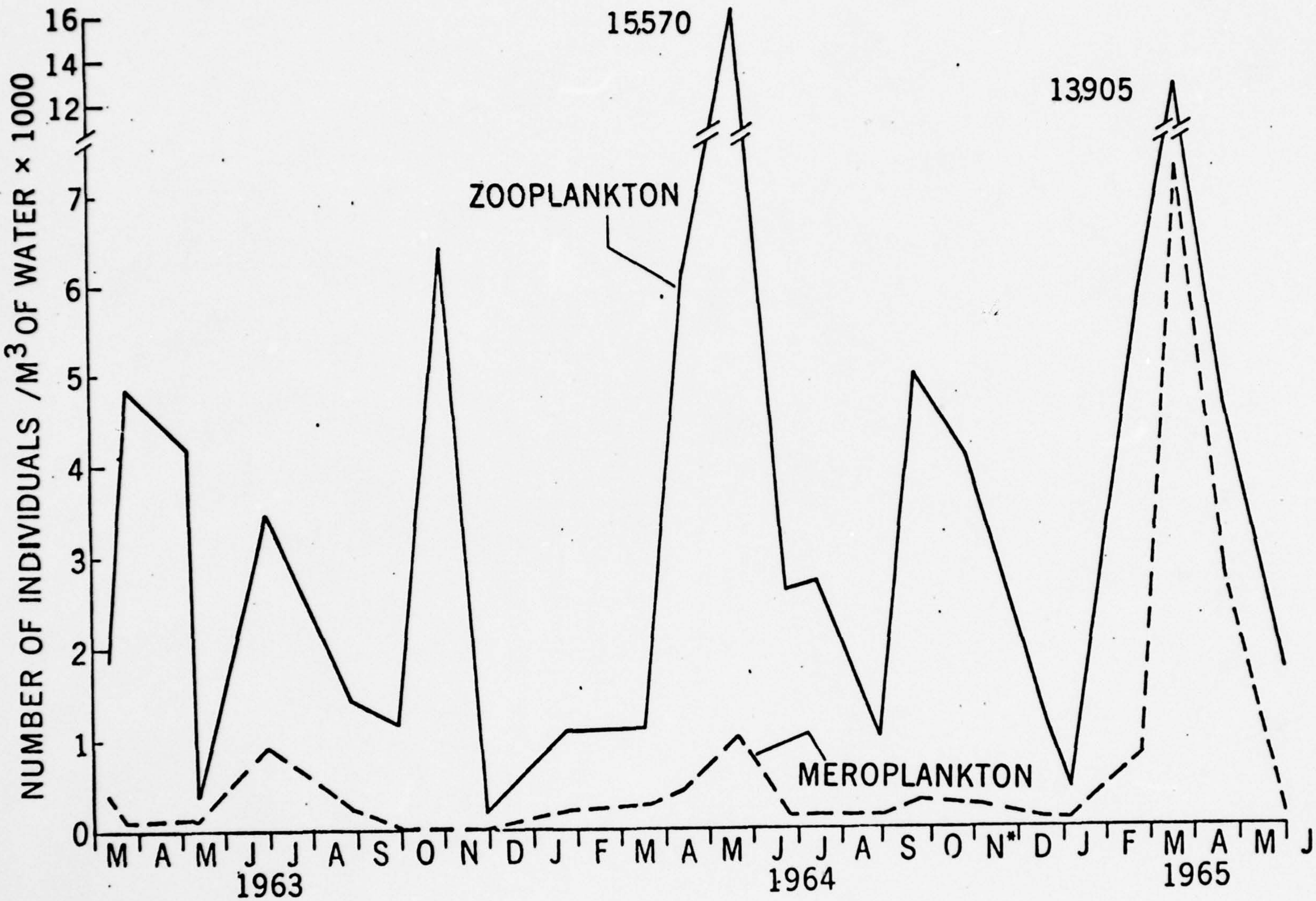


Figure 80. Temporal trends in the total zooplankton and the meroplankton populations collected by NMFS, 1963-1965

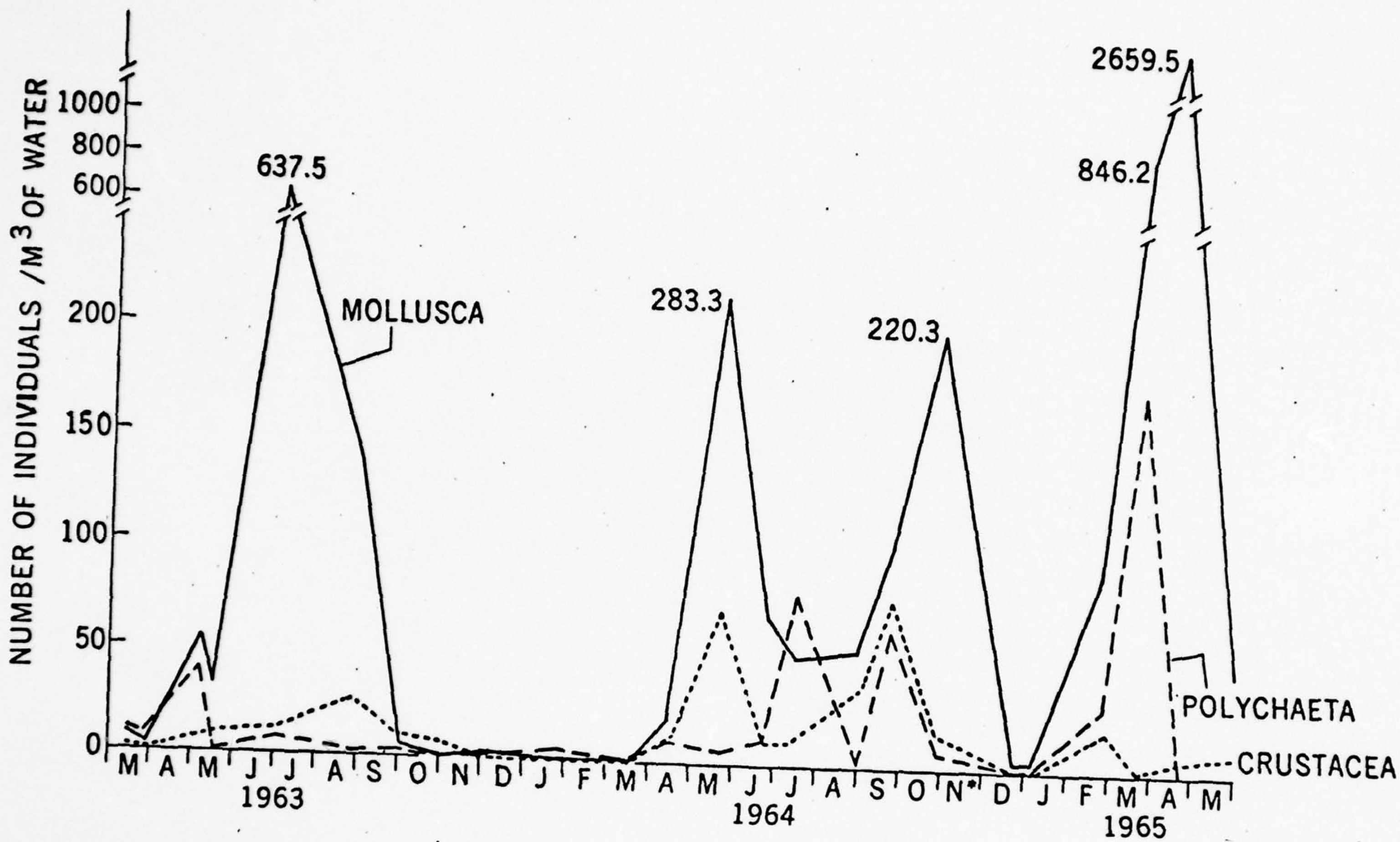


Figure 81. Temporal trends in the larval populations of the Polychaeta, Crustacea, and Mollusca collected by NMFS, 1963-1965

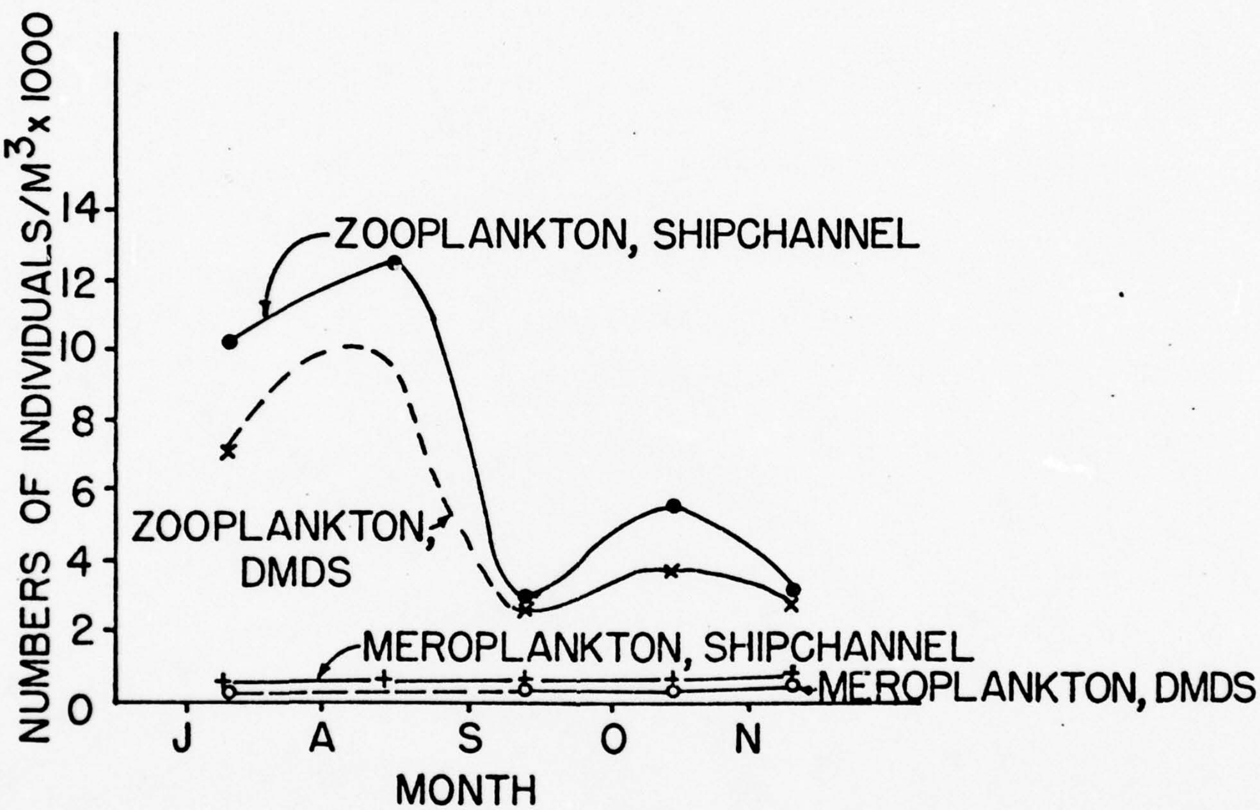


Figure 82. Temporal trends in the total zooplankton and the meroplankton populations in the ship channel and in the DMDS

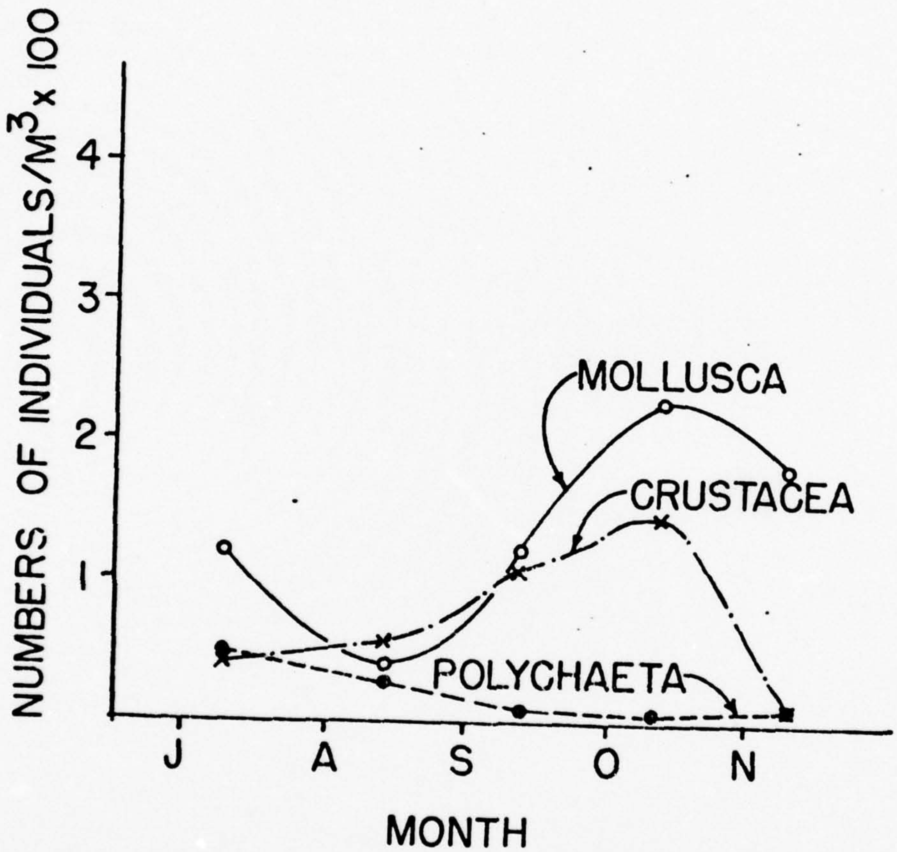


Figure 83. Temporal trends of the larval populations of the Polychaeta, Crustacea, and Mollusca in the DMDS

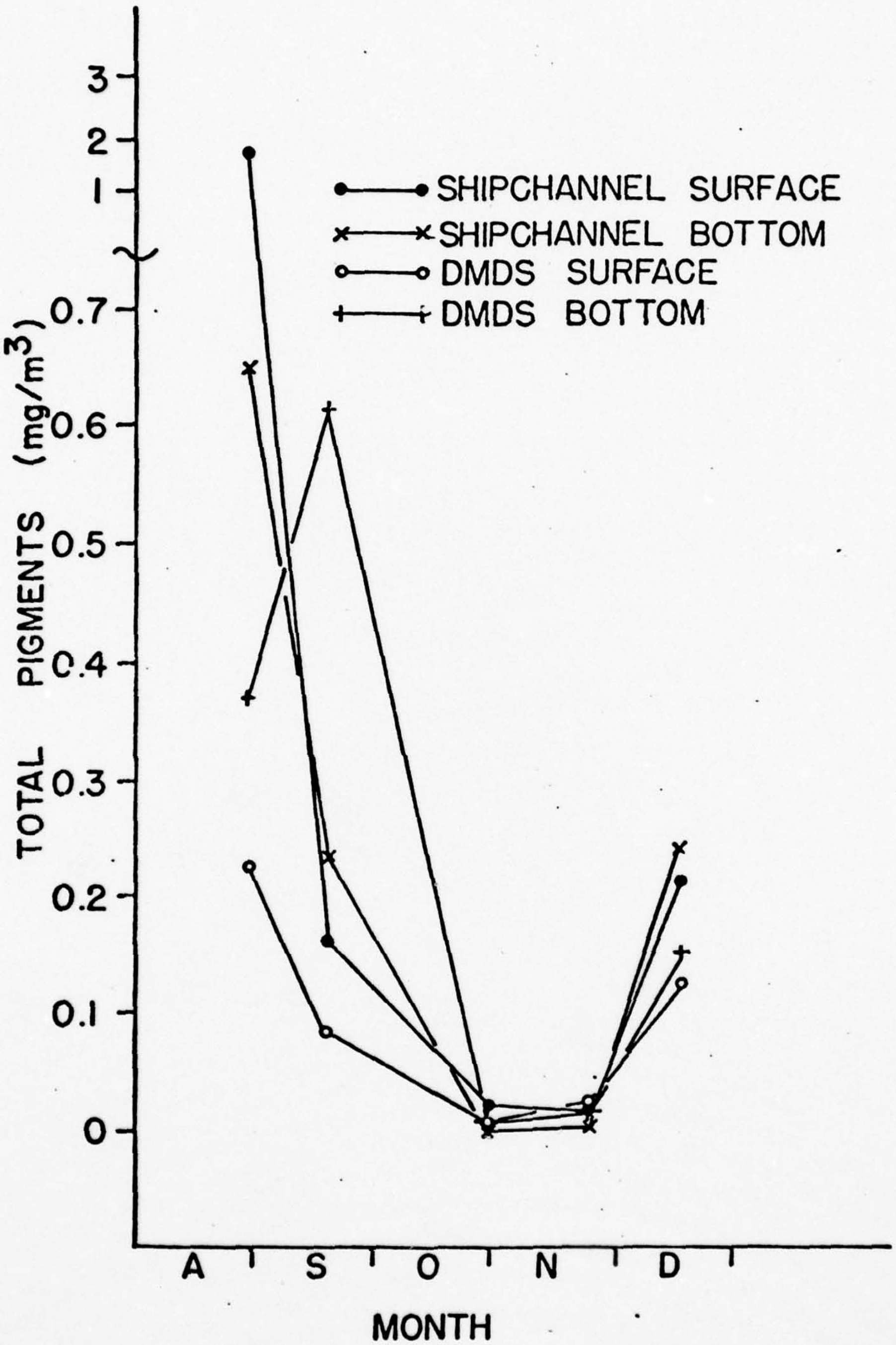


Figure 84. Temporal trends in phytoplankton pigment concentrations in the ship channel and DMDS

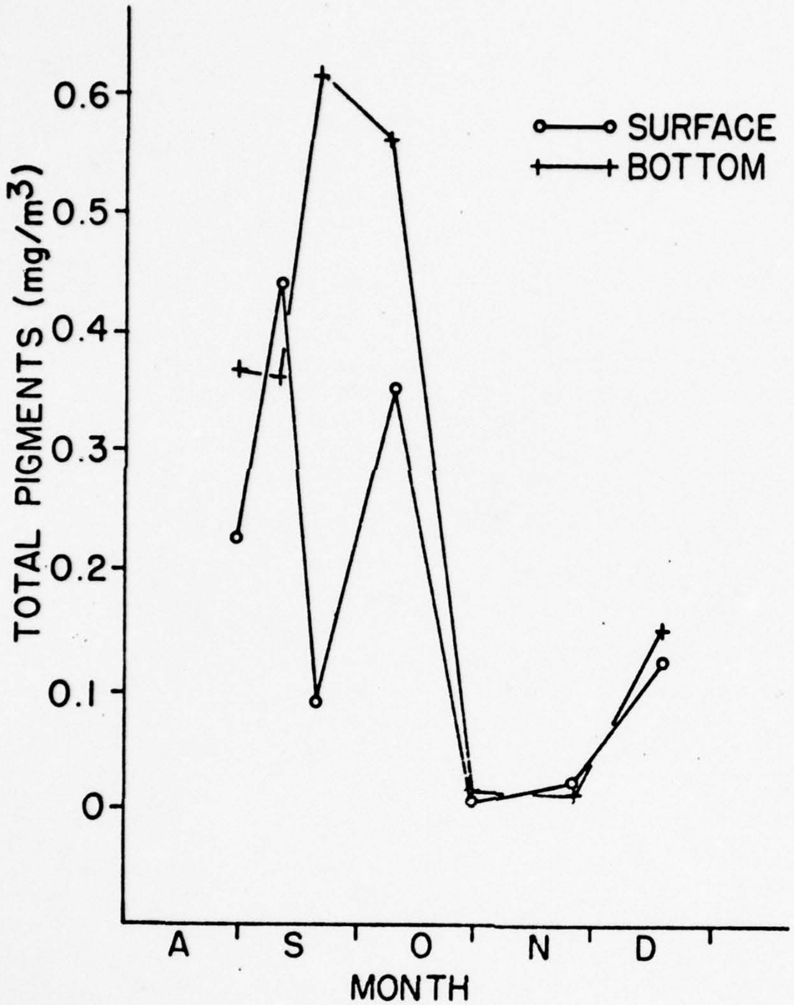
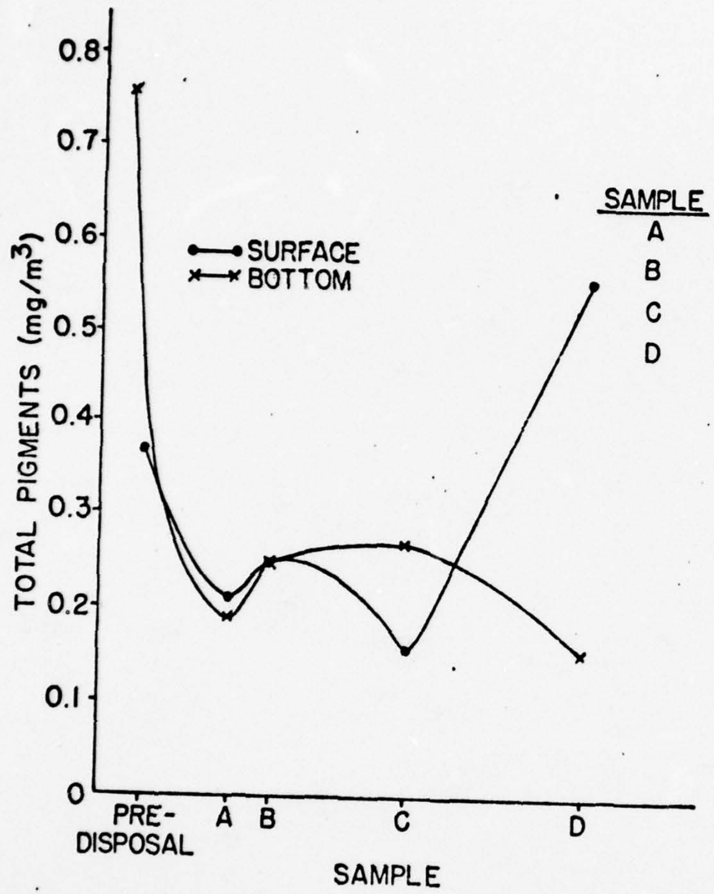


Figure 85. Temporal trends in phytoplankton pigment concentrations in the DMDS only

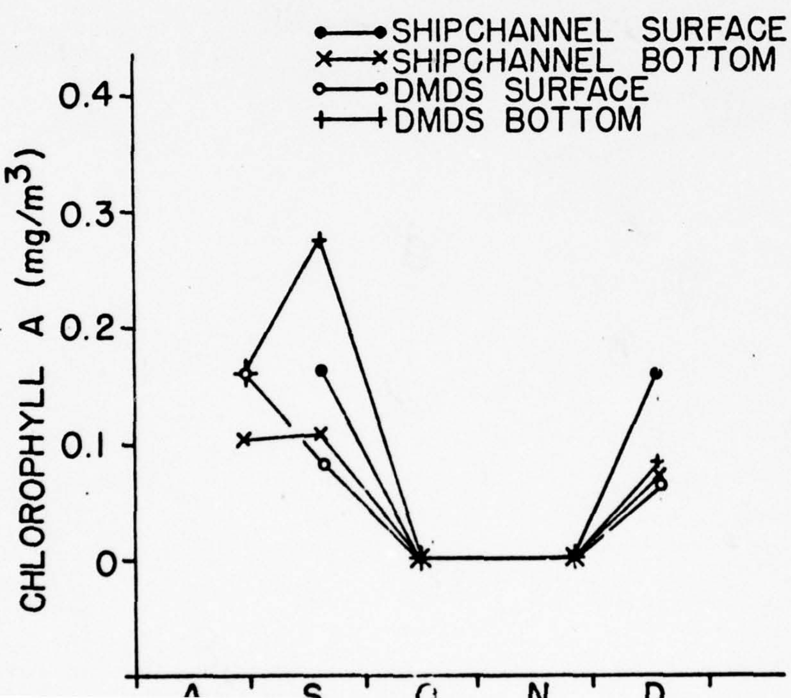


SAMPLE	TIME	RELATIVE TURBIDITY SURFACE	RELATIVE TURBIDITY BOTTOM
A	1550	TURBID	TURBID
B	1556	CLEAR	TURBID
C	1610	CLEAR	CLOUDY
D	1630	CLEAR	CLEAR

Figure 86. Changes in phytoplankton pigment concentrations before and after the Texas City material experimental disposal

AD-A061 844 ARMY ENGINEER WATERWAYS EXPERIMENT STATION VICKSBURG MISS F/G 13/3
AQUATIC DISPOSAL FIELD INVESTIGATIONS GALVESTON, TEXAS, OFFSHOR--ETC(U)
MAY 78 T D WRIGHT, D B MATHIS, J M BRANNON
UNCLASSIFIED WES-TR-D-77-20 NL

5 OF 10
ADA
061844


SHIPCHANNEL SURFACE
SHIPCHANNEL BOTTOM
DMDS SURFACE
DMDS BOTTOM
CHLOROPHYLL A (mg/m3)
0.4
0.3
0.2
0.1
0
A
S
O
N
D

APPENDIX A
RAW ABIOTIC DATA

Table A1. Average annual water temperatures (°C) in the Galveston Channel, 1922-1975. Data Collected by National Ocean Survey personnel. * - Data extrapolated to 12 months

Year	Average Temperature	Year	Average Temperature
1922	23.4	1949	22.3
1923	27.8	1950	22.9
1924	22.3	1951	22.0
1925	27.8	1952	21.8
1926	23.3	1953	22.1
1927		1954	22.2
1928	24.8	1955	22.0
1929		1956	22.2
1930		1957	22.3
1931	22.4	1958	22.2
1932	22.2	1959	21.3
1933	23.2	1960	21.2
1934	22.9	1961	21.1
1935	*22.5	1962	22.2
1936	21.3	1963	21.8
1937	22.0	1964	21.3
1938	22.3	1965	22.2
1939	22.2	1966	21.6
1940	20.8	1967	21.7
1941	21.9	1968	21.4
1942	22.0	1969	21.8
1943		1970	21.4
1944	22.3	1971	22.1
1945	22.4	1972	22.0
1946	22.4	1973	21.4
1947	21.6	1974	21.9
1948	21.8	1975	*21.8

Table A2. Surface and bottom water temperature recorded at station W53 by National Marine Fisheries Service personnel 1963-1965. (Temperature in °C)

1963

	3/11	3/26	*4/2	5/7	5/13	*5/19	7/1	7/17	8/27	10/1	10/30	11/29	12/18
Surface	14.8	19.7	22.2	25.3	24.8	26.7	29.2	29.4	30.9	25.6	24.3	16.8	11.0
Bottom	14.3	19.1	20.4	24.2	24.2	23.2	29.2	29.0	30.3	26.1	24.3	16.7	10.9

1964

	1/25	*2/19	3/17	4/14	5/21	6/24	7/15	**8/28	**9/24	**10/27	**11/18	**12/19
Surface	10.4	12.4	16.3	19.7	27.4	30.2	29.0	29.6	28.0	21.5	23.9	12.0
Bottom	9.6	12.2	14.9	19.7	26.2	28.8	28.2	29.4	28.1	21.5	23.9	12.0

1965

	1/6	1/10	2/25	3/20	4/23	6/2	6/15	8/10	9/8	12/8
Surface		15.4	13.2	14.0	23.2	27.3	29.3	29.0	29.0	
Bottom	15.6	16.0	13.2	14.0	23.2	26.5	26.0	29.0	28.3	17.2

These temperature data are from unpublished station W53 data supplied by Bob Temple. The W53 data has been supplemented in part by station W55 data.

* surface and bottom temperatures are from station W55
** surface temperatures are from station W55

Table A3

Average Surface Temperatures (Harper, 1970)

Date	Average Temperature
1968	
4 August	30.2
27 August	30.6
24 September	28.2
17 October	25.8
23 October	24.3
4 December	15.2
1969	
26 February	14.5
13 May	24.3
21 May	26.1

Table A4. The average daily temperature of the surface and bottom of the water column and of the sediment collected during the dredged water disposal study and related studies by Henry (1976) and Henningsen (in MS).

1975

	4/15	4/16	4/17	4/29	5/3	5/6	5/13	5/15	6/21	7/14	7/21	7/22	7/23	7/24	7/25
Surface	18.7	19.9	20.2	23.6	24.6	25.1	25.5	25.1	29.0	29.4	28.5	29.1	29.6	30.0	29.9
Bottom							25.5								
Sediment						23.6				26.0	28.0	28.0	28.0	27.8	28.4

1975

	9/3	9/6	9/15	9/16	9/17	9/18	9/19	9/20	9/27	9/28	10/9	10/27	10/30
Surface	28.0	28.2	28.0	28.0	28.0	28.2	28.3	28.0	26.0	24.0	24.5	23.0	23.0
Bottom	28.3	27.8	28.0	28.5	28.0	27.8	28.3	28.0	26.0	26.7	24.5	23.0	23.0
Sediment	28.8		28.0	28.1	28.0	28.0		28.0		27.7			23.0

	1975								1976					
	11/22	11/23	11/24	11/25	12/3	12/4	12/16	12/17	1/17	1/20	1/21	1/22	1/23	2/19
Surface	16.3	16.4	16.5	18.0	16.2	17.1	15.0	16.0	12.0	12.0	12.5	13.4	13.0	18.5
Bottom	17.5	17.4	21.2	19.4	16.9	17.4	15.2	16.4	11.0	12.1	12.3	13.5	13.0	16.8
Sediment		20.4	21.1	21.0	17.2	17.0		16.8		12.5	12.2	13.7	13.3	17.0

1976

	3/11	3/27	3/31	4/1	4/23	4/30	5/13	5/14	5/24	5/25
Surface	19.1	20.8	19.7	20.1	23.1	23.2	24.5	25.0	26.1	26.0
Bottom	19.0	19.5	19.5	22.7	22.4	23.5	23.5	23.6	24.7	24.5
Sediment		20.0	19.6	19.9		22.8		23.1	25.0	24.8

Table A5. Monthly mean fresh water discharge in $m^3 \times 10^6$ entering the Galveston Bay - Trinity Bay System. From U. S. Geological Survey gauging stations: 1) Trinity River at Romayor; 2) Lake Houston spillway; 3) Buffalo Bayou at Houston; 4) White Oak Bayou at Houston; 5) Brays Bayou at Houston; 6) Sims Bayou at Houston; 7) Hunting Bayou at Houston; 8) Greens Bayou at Houston; 9) Halls Bayou at Houston; 9) Clear Creek at Pearland; 10) Vince Bayou at Pasadena; 11) Cedar Bayou near Crosby.

	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.
1976	4,754	4,718	7,274	19,259	51,758	43,402	18,917	3,044	6,898			
1975	37,828	82,532	28,408	51,750	59,598	56,092	18,758	13,580	4,680	3,738	4,541	3,947
1974	77,237	22,584	13,377	8,557	24,383	10,042	5,772	5,721	49,737	16,784	96,291	68,551
1973	27,931	33,473	61,231	73,834	61,768	108,988	23,414	11,224	18,711	79,542	44,944	39,318
1972	50,630	14,153	8,650	5,559	24,933	5,789	4,125	1,916	2,410	∇1,940	14,461	10,110
1971	1,155	1,830	2,606	3,501	4,343	3,257	2,934	3,088	4,722	2,616	13,211	62,754
1970	12,724	10,810	56,143	24,082	16,269	7,730	5,562	3,318	4,578	11,233	2,936	1,233
1969	9,540	36,250	63,449	73,041	98,422	36,287	5,694	4,177	4,510	4,028	5,958	10,064
1968	34,606	23,529	36,434	74,546	86,092	78,422	21,750	5,633	5,662	5,403	6,452	21,559
1967	3,019	2,912	2,758	9,305	6,462	*12,489	5,339	1,884	7,372	7,509	20,840	13,443
1966	12,450	31,555	8,669	35,474	139,984	29,656	15,249	7,512	6,438	5,351	2,031	2,530
1965	13,805	41,469	20,001	16,639	48,580	36,352	3,318	2,151	2,765	2,770	6,367	18,300
1964	4,363	7,820	16,805	14,255	*9,560	6,653	1,674	2,011	3,521	14,050	13,066	*21,819

Table A5 (continued)

	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.
1963	12,682	12,388	5,366	+7,593	19,230	7,940	2,851	1,605	1,791	1,133	1,850	3,700
1962	°15,151	17,475	9,526	10,869	23,071	9,056	7,397	9,513	16,599	20,754	7,451	24,569
1961	96,257	78,495	32,355	22,778	5,593	27,336	28,313	4,788	38,142	3,465	7,336	23,813
1960	59,255	42,732	38,709	7,311	13,756	28,281	14,532	10,382	4,862	17,916	37,645	72,219
1959	2,466	26,194	8,035	59,483	45,817	15,750	23,071	8,454	3,489	×31,882	13,318	33,855
1958	51,883	28,259	18,939	20,629	97,468	20,309	11,092	4,018	19,541	9,271	3,678	2,692
1957	1,294	5,481	13,421	43,723	169,033	115,491	24,376	24,955	6,066	51,088	69,143	26,267
1956	2,254	9,296	2,454	6,144	12,985	2,126	587	504	722	Δ521	3,315	1,429
1955	7,869	31,900	7,815	25,325	7,284	4,429	1,622	1,921	1,769	1,752	724	1,123
1954	9,242	3,780	3,178	θ3,758	15,462	1,931	2,780	3,873	1,023	513	10,044	2,944
1953	11,336	14,706	22,726	11,158	113,529	12,885	2,354	3,497	3,301	1,909	5,373	16,027
1952	2,552	8,620	7,639	32,281	31,868	16,827	2,058	1,003	1,042	†793	3,247	15,927
1951	3,541	6,952	8,667	5,080	5,846	24,253	5,635	1,468	3,602	1,417	1,732	2,415
1950	51,812	92,748	32,176	27,990	55,573	54,937	11,963	9,692	15,809	8,290	3,646	2,640
1949										62,987	11,011	33,492

Table A5 (continued)

Total	617,636	692,661	535,811	693,924	1,248,667	777,210	271,137	150,932	239,762	368,655	410,611	536,740
$\bar{X}$	22,875	25,654	19,845	25,701	46,247	28,786	10,042	5,590	8,880	13,654	15,208	19,879
Years	27	27	27	27	27	27	27	27	27	27	27	27
1950-1975	612,882	687,943	528,537	674,665	1,196,909	733,808	252,220	147,888	232,864	305,668	399,600	503,248
$\bar{X}$	23,572	26,459	20,328	25,949	46,034	28,223	9,701	5,688	8,956	11,756	15,369	19,356

*1st Hunting Bayou Records
+Clear Creek Resumed
oBuffalo Resumed
×Clear Creek Discontinued
ΔBuffalo Discontinued
∇Vince and Cedar Begun
†Sims, Grees, and Halls Begin
ΘLake Houston Began Filling

Table A6. Monthly average freshwater discharge (m^3/sec) into Galveston Bay, 1950-1976. From U. S. Geological Survey water records.

Year	$m^3 \times 10^6$	
1975	30,454	
1974	33,253	
1973	48,698	
1972	12,056	Vince and Cedar begin, October
1971	8,835	
1970	13,052	
1969	29,285	
1968	33,341	
1967	7,778	
1966	24,742	
1965	17,751	
1964	9,633	Hunting begin, May
1963	6,511	
1962	14,286	Clear Creek, not recorded
1961	30,723	OCT 59 - APR 63
1960	28,967	
1959	22,651	Buffalo Bayou, not recorded
1958	23,982	OCT 56 - DEC 61
1957	45,862	
1956	3,528	
1955	7,794	
1954	4,794	Lake Houston storage begin, April
1953	18,233	
1952	10,321	Sims, Halls, Greens begin, October
1951	5,884	
1950	30,606	
TOTAL	523,020	
$\bar{X}$	20,116	

Table A7. Average annual salinities in the Galveston Channel, 1922-1975. Data collected by National Ocean Survey personnel. * - average of 11 months data

Year	ppt	Year	ppt	Year	ppt
1922		1940	25.9	1958	23.3
1923	21.4	1941	19.0	1959	23.5
1924	21.7	1942	21.4	1960	24.4
1925	27.6*	1943		1961	21.3
1926	19.9*	1944	23.5	1962	26.9
1927		1945	18.6	1963	29.9
1928	23.4	1946	18.8	1964	28.1
1929		1947	22.7	1965	25.8
1930		1948	25.4	1966	24.3
1931	26.8	1949	21.8	1967	27.5
1932	23.5	1950	20.5	1968	21.7
1933	24.1	1951	27.7	1969	23.5
1934	25.1	1952	26.3	1970	25.6
1935	20.9*	1953	25.0*	1971	28.0
1936	25.4	1954	31.0	1972	24.4
1937	26.1	1955	28.4	1973	19.5
1938	24.2	1956	30.7	1974	21.0
1939	27.7	1957	24.3	1975	19.0*
				$\bar{X}$	24.2

Table A8

Surface and Bottom Salinities Recorded at Station W7 by Marine Fisheries Service Personnel, 1963-1965

(Salinities in ppt)

	1963								
	2/6	3/2	4/3	5/7	5/20	7/1	7/17	8/28	10/2
Surface	31.0	31.3	29.3		34.3	34.7	36.5		30.2
Bottom	31.7	31.3	32.4	34.1	35.8	35.3	36.6	36.9	30.7

	1963		1964						
	11/30	12/19	1/26	2/19	3/22	4/15	5/22	6/25	7/16
Surface	33.2	32.6	32.8	35.0	31.9	28.8	26.3	31.6	34.8
Bottom	33.4	32.5	34.0	35.0	34.8	29.3	27.5	34.3	34.8

	1964					1965			
	8/29	9/25	10/28	11/19	12/19	1/10	2/26	3/21	4/23
Surface	36.4	31.4	32.9	31.0	30.2	30.5	33.4	32.5	30.0
Bottom	36.3	31.5	32.9	31.0	30.6	33.8	35.6	32.4	30.0

	1965		
	6/2	6/15	8/11
Surface	21.2	24.5	34.9
Bottom	31.9	34.8	35.3

Table A9. Average surface water salinities recorded in 1968-1969 offshore for Galveston in 3.6 to 10.8 m depth. (Harper 1970)

Date	Average Temperature
1968	
4 August	29.2
27 August	24.0
24 September	23.8
17 October	26.2
23 October	25.7
4 December	30.0
1969	
26 February	24.0
13 May	22.5
21 May	23.4

Table A10. Salinity data collected during the dredged material disposal study. From field data and from Henry (1976) and Henningsen (in MS).

						1975								
	4/16	4/17	4/29	5/3	5/4	5/15	6/21	7/14	7/21	7/22	7/23	7/24	7/25	9/3	9/6
Surface	21.3	23.3	12.0	10.8	14.0	18.0	18.2	31.0	31.0	31.0	31.0	32.0	32.4	27.3	26.0
Bottom														32.0	31.4

							1975								
	9/15	9/16	9/17	9/18	9/19	9/20	9/24	9/27	9/28	10/27	10/30	11/22	11/23	12/3	12/4
Surface	25.0	24.5	27.8	24.4	25.5	23.5	21.0	27.0	27.0	24.2	24.0	23.5	24.5	27.6	29.0
Bottom	28.5	29.0	31.0	29.6	27.0	29.3	27.8	28.0	27.0	25.2	25.0	25.3	26.9	30.6	30.4

	1975								1976						
	12/16	12/17	1/16	1/17	1/20	1/21	1/22	1/23	2/19	3/11	3/27	3/31	4/1	4/23	4/30
Surface	24.0	25.5	25.4	23.0	25.0	25.0	25.8	25.6	28.0	24.0	22.2	24.5	25.0	22.0	24.0
Bottom	26.2	26.0	26.0	28.0	26.0	26.0	28.5	28.0	29.2	25.0	23.7	31.0	32.1	26.3	25.5

		1976	
	5/14	5/24	5/25
Surface	24.2	27.9	28.3
Bottom	28.8	30.0	33.3

APPENDIX B

RAW BENTHIC DATA FROM THE PILOT STUDY

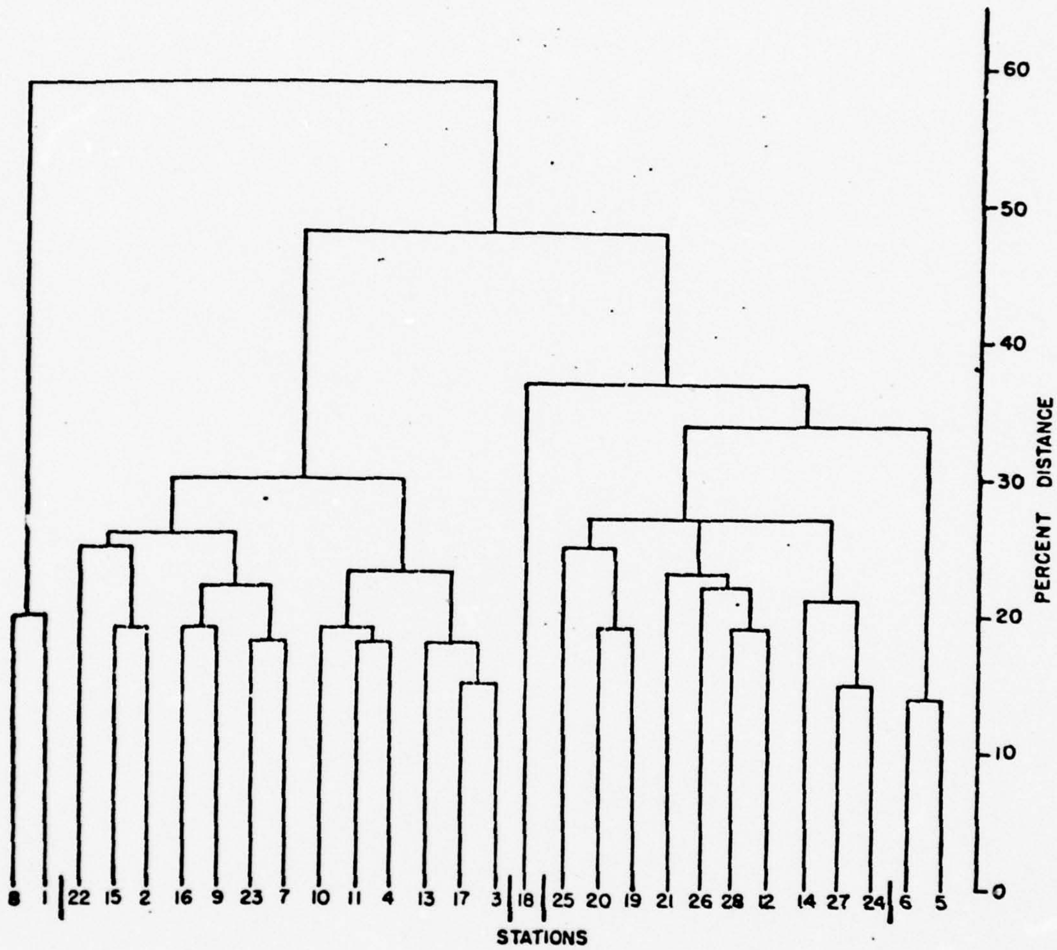


Figure B1. Site group dendrogram of the benthic assemblages in the DMDS during the pilot study. Site groups based on 70 species

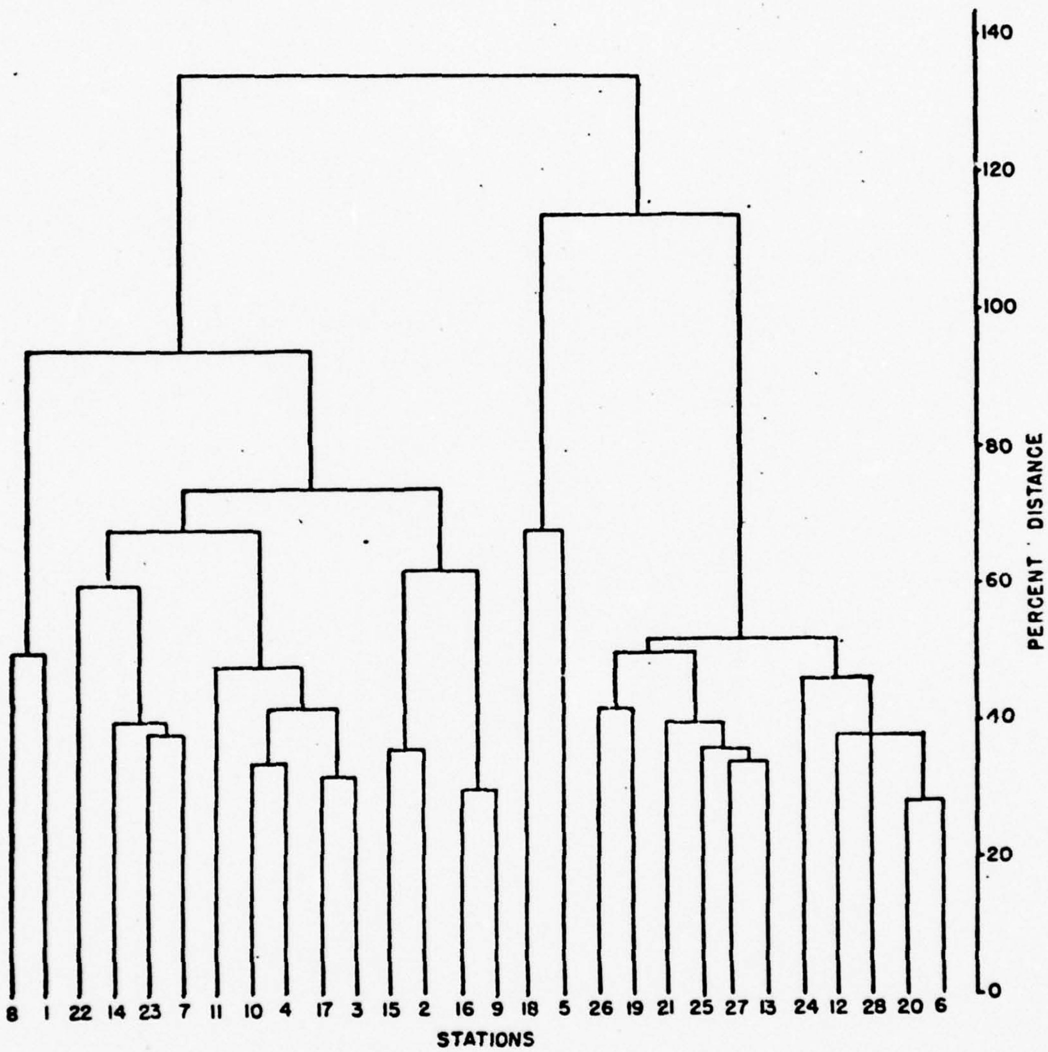


Figure B2. Site group dendrogram of the benthic assemblages in the DMDS during the pilot study. Site groups based on 41 species

Table B1. Taxonomic list of all benthic species collected during the pilot study in the offshore disposal site, Galveston, Texas. * = single occurrences

Cnidaria
- *Anemone A
- **Lovenella gracilis*
- *Paranthus rapiformis*

Nemertea
- *Cerebratulus lacteus*
- *Cerebratulus luridus*
- Nemertea, yellow band
- Nemertea, yellow & purple band

Phoronida
- *Phoronis architecta*

Bryozoa
- **Electra* sp.

Mollusca
- *Abra aequalis*
- *Anadara transversa*
- *Bivalvia A
- **Dosinia discus*
- *Lunarca ovalis*
- *Mulinia lateralis*
- *Mysella planulata*
- *Nassarius acutus*
- *Natica pusilla*
- **Noetia ponderosa*
- *Nuculana concentrica*
- *Odostomia gibbosa*
- *Paramya subovata*
- **Polinices duplicatus*
- **Tellina* sp. A
- *Terebra dislocata*

Echiurida
- *Thalassema hartmani*

Sipunculida
- *Phascolion strombi*

Polychaeta
- *Aglaophamus verrilli*
- **Ampharete acutifrons*
- *Ampharete*, eyes
- *Ancistrosyllis hartmanae*

Polychaete (continued)
- *Ancistrosyllis jonesi*
- **Ancistrosyllis*, setiger 7
- *Aricidea fragilis*
- *Armandia agilis*
- *Asychis carolinae*
- *Boccardia* sp.
- **Ceratocephale*, eyes
- *Cirratulus hedgpethi*
- *Clymenella zonalis*
- *Cossura delta*
- *Diopatra cuprea*
- *Glycera americana*
- *Glycinde solitaria*
- **Grubeulepis* sp.
- *Gyptis vittata*
- *Lepidasthenia* sp.
- *Lepidonotus sublevis*
- *Lumbrineris tenuis*
- *Magelona riojai*
- *Magelona rosea*
- *Magelona* sp.
- *Marphysa aransensis*
- *Mediomastus californiensis*
- **Melinna maculata*
- *Nephtys incisa*
- **Nephtys magellanica*
- *Nephtys bucera*
- *Nereis succinea*
- *Nereis* sp.
- *Ninoe nigripes*
- *Notomastus hemipodus*
- *Notomastus latericeus*
- *Owenia fusiformis*
- *Polydora* sp.
- *Prionospio pinnata*
- *Pseudeurythoe ambigua*
- *Sigambra bassi*
- **Sigambra*, setiger 2
- *Sigambra tentaculata*
- *Sigambra wassi*
- *Spiochaetopterus oculatus*
- *Spiophanes bombyx*
- *Sthenalais boa*

Table B1 (continued)

Crustacea
- *Albunea paretti*
- *Ampelisca abdita*
- *Automate evermanni*
- *Callianassa acanthochirus*
- *Callianassa latispina*
- *Callinectes similis*
- *Corophium acherusicum*
- *Hepatus epheliticus*
- *Listriella* sp.
- *Oxyurostylis salinoi*
- *Pagurus annulipes*
- *Panopeus turgidus*
- *Pinnixa cristata*
- *Pinnixa lunzi*

Echinodermata
- *Hemipholis elongata*
- *Micropholis atra*

Hemichordata
- *Balanoglossus* sp.

Osteichthys
- *Bascanichthys teres*

Incertae sedis
- Specis A

Table B2. List of species collected during the pilot study, April-May 1975, ranked by number of occurrences. Data also included: the total number of individuals of each species; the average number per occurrence; the average number per station; the maximum number of individuals at any station; and the cumulative percentage of the total number of individuals.

RANK	NAME	ROW #	# OCC	TOTAL #	#/OCC	#/COL	MAX	CUM % OF TOTAL #
1.	DIOPATRA CUPREA	1	28	2240.00	80.00	80.00	240.00	2.20
2.	PRIONOSPIO PINNATA	2	27	5424.00	200.89	193.71	896.00	7.53
3.	CEREBRATULUS LACTEUS	3	23	3792.00	164.87	135.43	816.00	11.25
4.	BALANOGLOSSUS	4	20	61584.00	3079.20	2199.43	16512.00	71.74
5.	MAGELONA SP	5	20	2016.00	100.80	72.00	352.00	73.72
6.	LUMBRINERIS TENUIS	6	20	1376.00	68.80	49.14	208.00	75.07
7.	NASSARIUS ACUTUS	7	20	1168.00	58.40	41.71	288.00	76.22
8.	SIGAMBRA WASSI	8	19	1184.00	62.32	42.29	288.00	77.38
9.	SIGAMBRA TENTACULATA	9	19	656.00	34.53	23.43	80.00	78.03
10.	GLYCERA AMERICANA	10	18	848.00	47.11	30.29	160.00	78.86
11.	GLYCINDE SOLITARIA	11	17	512.00	30.12	18.29	112.00	79.37
12.	NEMERTEA (YELLOW BANDED)	12	16	656.00	41.00	23.43	144.00	80.01
13.	PINNIXA CRISTATA	13	15	1024.00	68.27	36.57	304.00	81.02
14.	PHASCOLION STROMBI	14	15	752.00	50.13	26.86	112.00	81.75
15.	NEREIS SP	15	14	992.00	70.86	35.43	224.00	82.73
16.	PHORONIS ARCHITECTA	16	12	5520.00	460.00	197.14	2960.00	88.15
17.	AMPELISCA ABDITA	17	12	288.00	24.00	10.29	32.00	88.43
18.	CLYMENELLA ZONALIS	18	11	656.00	59.64	23.43	240.00	89.08
19.	COROPHIUM ACHERUSICUM	19	11	496.00	45.09	17.71	112.00	89.56
20.	NINOE NIGRIPES	20	11	320.00	29.09	11.43	48.00	89.89
21.	NOTOMASTUS LATERICEUS	21	10	656.00	65.60	23.43	192.00	90.52
22.	TEREBRA PROTEXTA	22	10	384.00	38.40	13.71	80.00	90.90
23.	PSEUDEURYTHOE AMBIGUA	23	8	736.00	92.00	26.29	320.00	91.62
24.	MEDIOMASTUS CALIFORNIENSIS	24	8	320.00	40.00	11.43	96.00	91.94
25.	COSSURA DELTA	25	8	240.00	30.00	8.57	96.00	92.17
26.	HEMIPHOLIS ELONGATA	26	8	208.00	26.00	7.43	64.00	92.38
27.	NUCULANA CONCENTRICA	27	8	160.00	20.00	5.71	32.00	92.53
28.	ABRA AEQUALIS	28	8	128.00	16.00	4.57	16.00	92.66
29.	ANCISTROSYLLIS JONESI	29	7	224.00	32.00	8.00	96.00	92.88
30.	STHENELAIS BOA	30	7	144.00	20.57	5.14	32.00	93.02
31.	NOTOMASTUS HEMIPODUS	31	6	208.00	34.67	7.43	96.00	93.23
32.	NATICA PUSILLA	32	6	144.00	24.00	5.14	48.00	93.37
33.	SPIOCHAETOPTERUS OCULATUS	33	6	128.00	21.33	4.57	32.00	93.49
34.	OWENIA FUSIFORMIS	34	5	304.00	60.80	10.86	240.00	93.79
35.	GYPTIS VITTATA	35	5	192.00	38.40	6.86	80.00	93.98
36.	PARANTHUS RAPIFORMIS	36	5	176.00	35.20	6.29	80.00	94.15
37.	AMPHARETE (EYES)	37	5	144.00	28.80	5.14	48.00	94.30
38.	NEMERTEA (YELLOW & PURPLE)	38	5	112.00	22.40	4.00	32.00	94.41
39.	CIRRATULUS HEDGPETHI	39	5	96.00	19.20	3.43	32.00	94.50
40.	NEPHTYS INCISA	40	5	96.00	19.20	3.43	32.00	94.59
41.	THALASSEMA HARTMANI	41	4	1088.00	272.00	38.86	976.00	95.66
42.	LEPIDONOTUS SUBLEVIS	42	4	288.00	72.00	10.29	224.00	95.95
43.	ARMANDIA AGILIS	43	4	224.00	56.00	8.00	128.00	96.17
44.	AGLAOPHAMUS VERRILLI	44	4	96.00	24.00	3.43	32.00	96.26
45.	ANACHIS OBESA	45	4	80.00	20.00	2.86	32.00	96.34
46.	ASYCHIS ELONGATA	46	4	80.00	20.00	2.86	32.00	96.42
47.	SIGAMBRA BASSI	47	4	80.00	20.00	2.86	32.00	96.50
48.	ANCISTROSYLLIS (POST FRAG)	48	4	80.00	20.00	2.86	32.00	96.57
49.	CALLIANASSA LATISPINA	49	4	64.00	16.00	2.29	16.00	96.64
50.	MALDANIDAE	50	4	64.00	16.00	2.29	16.00	96.70
51.	PINNIXA LUNZI	51	3	352.00	117.33	12.57	192.00	97.05
52.	PSEUDOPOLYDORA SP.	52	3	240.00	80.00	8.57	144.00	97.29
53.	PHOLADIDAE	53	3	208.00	69.33	7.43	160.00	97.39
54.	MAGELONA RIOJAI	54	3	208.00	69.33	7.43	112.00	97.59

Table B2 continued

55.	SPIOPHANES BOMBYX	55	3	208.00	69.33	7.43	112.00	97.89
56.	CEREBRATULUS LURIDUS	56	3	160.00	53.33	5.71	128.00	98.05
57.	NEPHTYS BUCERA	57	3	112.00	37.33	4.00	48.00	98.16
58.	ANCISTROSYLLIS HARTMANAE	58	3	64.00	21.33	2.29	32.00	98.22
59.	MULINIA LATERALIS	59	3	64.00	21.33	2.29	32.00	98.29
60.	LUNARCA OVALIS	60	3	48.00	16.00	1.71	16.00	98.33
61.	MAGELONA ROSEA	61	3	48.00	16.00	1.71	16.00	98.38
62.	CUOSTOMIA GIBBOSA	62	3	48.00	16.00	1.71	16.00	98.43
63.	PAGURUS ANNULIPES	63	2	80.00	40.00	2.86	64.00	98.51
64.	INCERTAE SEDIS	64	2	64.00	32.00	2.29	48.00	98.57
65.	MICROPHOLIS ATRA	65	2	64.00	32.00	2.29	32.00	98.63
66.	MYSELLA PLANULATA	66	2	64.00	32.00	2.29	48.00	98.70
67.	ARICIDEA FRAGILIS	67	2	64.00	32.00	2.29	48.00	98.76
68.	LEPIDASTHENIA SP	68	2	48.00	24.00	1.71	32.00	98.81
69.	BOCCARDIA SP	69	2	32.00	16.00	1.14	16.00	98.84
70.	CALLINECTES SIMILIS	70	2	32.00	16.00	1.14	16.00	98.87
71.	NEREIS SUCCINEA	71	2	32.00	16.00	1.14	16.00	98.90
72.	TEREBELLIDAE	72	2	32.00	16.00	1.14	16.00	98.93
73.	SPIONIDAE	73	2	32.00	16.00	1.14	16.00	98.96
74.	PARAMYA SUBOVATA	74	1	544.00	544.00	19.43	544.00	99.50
75.	PELECYPODA UNID	75	1	48.00	48.00	1.71	48.00	99.54
76.	ALBUNEA PARETII	76	1	32.00	32.00	1.14	32.00	99.58
77.	ANADARA TRANSVERSA	77	1	32.00	32.00	1.14	32.00	99.61
78.	AMPHARETE ACUTIFRONS	78	1	16.00	16.00	0.57	16.00	99.62
79.	AMPHIPODA A	79	1	16.00	16.00	0.57	16.00	99.64
80.	ANCISTROSYLLIS SP A	80	1	16.00	16.00	0.57	16.00	99.65
81.	ANCISTROSYLLIS SP C	81	1	16.00	16.00	0.57	16.00	99.67
82.	ANCISTROSYLLIS SETIGER	82	1	16.00	16.00	0.57	16.00	99.69
83.	ANEMONE A	83	1	16.00	16.00	0.57	16.00	99.70
84.	AUTOMATE EVERMANNI	84	1	16.00	16.00	0.57	16.00	99.72
85.	BASCANICHTHYS TERES	85	1	16.00	16.00	0.57	16.00	99.73
86.	CALLIANASSA ACANTHOCHIRUS	86	1	16.00	16.00	0.57	16.00	99.75
87.	CERATOCEPHALE SP.	87	1	16.00	16.00	0.57	16.00	99.76
88.	DOSINIA DISCUS	88	1	16.00	16.00	0.57	16.00	99.78
89.	ELECTRA SP (COLONIES)	89	1	16.00	16.00	0.57	16.00	99.80
90.	GLYCERA SP	90	1	16.00	16.00	0.57	16.00	99.81
91.	GRUBEULEPIS SP	91	1	16.00	16.00	0.57	16.00	99.83
92.	HEPATUS EPHELITICUS	92	1	16.00	16.00	0.57	16.00	99.84
93.	LOVENELLA GRACILIS (COL)	93	1	16.00	16.00	0.57	16.00	99.86
94.	MARPHYSA ARANSENSIS	94	1	16.00	16.00	0.57	16.00	99.87
95.	MELINNA MACULATA	95	1	16.00	16.00	0.57	16.00	99.89
96.	NEPHTYS MAGELLANICA	96	1	16.00	16.00	0.57	16.00	99.91
97.	NOETIA PONDEROSA	97	1	16.00	16.00	0.57	16.00	99.92
98.	OXYUROSTYLIS SALINCI	98	1	16.00	16.00	0.57	16.00	99.94
99.	PANOPEUS TURGIDUS	99	1	16.00	16.00	0.57	16.00	99.95
100.	SIGAMBRA SETIGER	100	1	16.00	16.00	0.57	16.00	99.97
101.	TELLINA VERSICOLOR	101	1	16.00	16.00	0.57	16.00	99.98
102.	POLYNOIDAE	102	1	16.00	16.00	0.57	16.00	100.00
TOTALS			610	101808.00				

OF COLUMNS = 28

Table B3. Pilot study macrobenthic data matrix, stations vs. species. Species ranked by number of occurrences.

	SPECIES	STATIONS 1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
1	DIOPATRA CUPREA	16	16	56	16	24	56	16	8	48	8	48	72	32	8	24
2	PRIONOSPIO PINNATA		64	144	24	8	16	72	8	208	112	24	24	96	48	224
3	CEREBRATULUS LACTEUS			88	80		24	96		48	48	48	136	168	56	
4	BALANOGLOSSUS			88	456	208	136	8256		136			2456	272	2736	
5	MAGELONA SP		72	24	24			120	72	16	40	64		176	24	80
6	LUMBRINERIS TENUIS		48	24	32			40		96	40	80	8	24	24	16
7	NASSARIUS ACUTUS	16	24	56	8	8	16		40	144	32	8	8	8	64	
8	SIGAMBRA WASSI			32	32		16	24			32	24	16	8		
9	SIGAMBRA TENTACULATA			24		8	8	16		16			16	8		8
10	GLYCERA AMERICANA		24	8	8	8		80	8	80	16	8	8	8	8	8
11	GLYCINDE SOLITARIA			56	16	8	8			8	24	8	8	8		16
12	NEMERTEA (YELLOW BANDED)		8	8	24			32	32	72	16	24	16			40
13	PINNIXA CRISTATA		8		16			8				16		32	152	8
14	PHASCOLION STROMBI	8	8	56		8		56		56	8					32
15	NEREIS SP	16	96	32				32	72	16		32		16		112
16	PHORONIS ARCHITECTA	248						8	208	1480	24	24			24	24
17	AMPELISCA ABDITA				16			16		16					8	16
18	CLYMENELLA ZONALIS			40	16			24		120	24		8			16
19	COROPHIUM ACHERUSICUM	48	56	8	8				24	24		16		8		16
20	NINOE NIGRIPES				16			24			24	16		8		8
21	NOTOMASTUS LATERICEUS		8		8					72		16				40
22	TEREBRA PROTEXTA		8	24						40				16	16	24
23	PSEUDEURYTHOE AMBIGUA				24					72			8			
24	MEDIOMASTUS CALIFORNIENSIS		48							48		8				24
25	COSSURA DELTA							8		8				8	8	
26	HEMIPHOLIS ELONGATA									8	8	32	8			8
27	NUCULANA CONCENTRICA					8	16								8	8
28	ABRA AEQUALIS			8				8						8	8	
29	ANCISTROSYLLIS JONESI													8		
30	STHENELAIS BOA	16			8			8	8						8	8
31	NOTOMASTUS HEMIPODUS	8	24					8	48							8
32	NATICA PUSILLA		16						8	8						24
33	SPIOCHAETOPTERUS OCULATUS									8						
34	OWENIA FUSIFORMIS	8								120	8					
35	GYPTIS VITTATA															
36	PARANTHUS RAPIFORMIS	40							16							
37	AMPHARETE (EYES)									8			8		8	24
39	NEMERTEA (YELLOW & PURPLE)	16		16								8	8			
39	CIRRATULUS HEDGPETHI												16			

Table B3 (continued)

SPECIES	STATIONS 1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
40 NEPHTYS INCISA						8							16		
41 THALASSEMA HARTMANI	24														24
42 LEPIDONOTUS SUBLEVIS		8													8
43 ARMANDIA AGILIS							24					8			
44 AGLAOPHAMUS VERRILLI	16		8					16		8					
45 ANACHIS OBESA			8				8			8					
46 ASYCHIS ELONGATA											16			8	
47 SIGAMBRA BASSI			8				8								
48 ANCISTROSYLLIS (POST FRAG)										16			8		
49 CALLIANASSA LATISPINA															
50 MALDANIDAE							8	8			8				8
51 PINNIXA LUNZI	56														8
52 POLYDORA SP A												72			
53 PHOLADIDAE															80
54 MAGELONA RIOJAI	40								8						
55 SPIOPHANES BOMBYX								56	40						
56 CEREBRATULUS LURIDUS														8	64
57 NEPHTYS PICTA	24							8	24						
58 ANCISTROSYLLIS HARTMANAE															8
59 MULINIA LATERALIS		8							8		16				
60 LUNARCA OVALIS									8						
61 MAGELONA ROSEA													8		
62 ODOSTOMIA GIBBOSA									8				8		
63 PAGURUS ANNULIPES									32					8	
64 INCERTAE SEDIS										24				8	
65 MICROPHOLIS ATRA		16					16								
66 MYSELLA PLANULATA															8
67 ARICIDEA FRAGILIS							24		8						
68 LEPIDASTHENIA SP											16				
69 BOCCARDIA SP							8								
70 CALLINECTES SIMILIS		8													8
71 NEREIS SUCCINEA	8	8													
72 TEREBELLIDAE											8				8
73 SPIONIDAE	8														
74 PARAPRIONOSPIO SUBOVATA															
75 PELECYPODA															
76 ALBUNEA PARETII	16														
77 ANADARA TRANSVERSA									16						
78 AMPHARETE ACUTIFRONS															
79 AMPHIPODA A									8						
80 ANCISTROSYLLIS SP A			8												
81 ANCISTROSYLLIS SP C									8						

Table B3 (continued)

SPECIES	STATIONS 1	2	3	4	5	6	[illegible]	8	9	10	11	12	13	14	15
82 ANCISTROSYLLIS SETIGER															
83 ANEMONE A															8
84 AUTOMATE EVERMANNI															
85 BASCANICHTHYS TERES														8	
86 CALLIANASSA ACANTHOCHIRUS															
87 CERATOCEPHALE SP.															
88 DOSINIA DISCUS															
89 ELECTRA SP (COLONIES)										8					
90 GLYCERA SP															
91 GRUBEULEPIS SP								8							
92 HEPATUS EPHELITICUS											8				
93 LOVENELLA GRACILIS (COL)	8														
94 MARPHYSA ARANSENSIS											8				
95 MELINNA MACULATA									8						
96 NEPHTYS MAGELLANICA				8											
97 NOETIA PONDEROSA															
98 OXYUROSTYLIS SALINOI				8											
99 PANOPEUS TURGIDUS															8
100 SIGAMBRA SETIGER							8								
101 TELLINA VERSICOLOR											8				
102 POLYNOIDAE															8

Table B3 (continued)

SPECIES	STATIONS 16	17	18	19	20	21	22	23	24	25	26	27	28
1 DIOPATRA CUPREA	88	48	40	24	40	120	16	32	16	88	40	24	96
2 PRIONOSPIO PINNATA	448	48	8	64	32	336	112	160	16	64	48	200	104
3 CEREBRATULUS LACTEUS	408	40	32	48	48	72	96	80	16	72	88	64	40
4 BALANOGLOSSUS		72		5392	1224	224	8	2552	584	200	1576	1080	2736
5 MAGELONA SP		72	16			72	16	40	32	8	32		8
6 LUMBRINERIS TENUIS	24	8				48	8	104	24	16	8	16	
7 NASSARIUS ACUTUS	8	8					64	8	24		16	24	
8 SIGAMBRA WASSI	24	32	32	48	8	8	144		8	72	16	16	
9 SIGAMBRA TENTACULATA	8	8		40	24	24		24	16	16	24	8	32
10 GLYCERA AMERICANA	16					8	32	56			40		
11 GLYCINDE SOLITARIA	8	32		8		16	8		8			16	
12 NEMERTEA (YELLOW BANDED)	16	8				8		8				8	8
13 PINNIXA CRISTATA	16	8					40	32	104	16		16	40
14 PHASCOLION STROMBI	16	40	8				16	48	8				8
15 NEREIS SP	8	16				24	16	8					
16 PHORONIS ARCHITECTA	576					16	112	16					
17 AMPELISCA ABDITA	16					8	8		8		8	8	16
18 CLYMENELLA ZONALIS	16	16					32	16					
19 COROPHIUM ACHERUSICUM	24										16		
20 NINOE NIGRIPES	8	24	8					16					8
21 NOTOMASTUS LATERICEUS	40			16			96	16					16
22 TEREBRA PROTEXTA							16	16	8			24	
23 PSEUDEURYTHOE AMBIGUA	64					8	160	24			8		
24 MEDIOMASTUS CALIFORNIENSIS	8			8					8		8		
25 GESSURA DELTA	48			8				24					8
26 HEMIPHOLIS ELONGATA		8								8			24
27 NUCULANA CONCENTRICA						8	8		8				16
28 ABRA AEQUALIS	8	8					8	8					
29 ANCISTROSYLLIS JONESI	8			8		8				48	24	8	
30 STHENELAIS BOA	16												
31 NOTOMASTUS HEMIPODUS										8			
32 NATICA PUSILLA							8	8					
33 SPIOCHAETOPTERUS OCULATUS	8	8					16	16					8
34 OWENIA FUSIFORMIS	8							8					
35 GYPTIS VITTATA				24		8	8		16		40		
36 PARANTHUS RAPIFORMIS	8							16		8			
37 AMPHARETE (EYES)	24												
38 NEMERTEA (YELLOW & PURPLE)		8											
39 CIRRATULUS HEDGPETHI						8	8				8		8

Table B3 (continued)

SPECIES	STATIONS 16	17	18	19	20	21	22	23	24	25	26	27	28
40 NEPHTYS INCISA				8							8		8
41 THALASSEMA HARTMANI							488				8		
42 LEPIDONOTUS SUBLEVIS					16		112						
43 ARMANDIA AGILIS											64		16
44 AGLAOPHAMUS VERRILLI													
45 ANACHIS OBESA							16						
46 ASYCHIS ELONGATA				8		8							
47 SIGAMBRA BASSI										8	16		
48 ANCISTROSYLLIS (POST FRAG)					8			8					
49 CALLIANASSA LATISPINA		8	8		8	8							
50 MALDANIDAE													
51 PINNIXA LUNZI							72						
52 POLYDORA SP A						40							8
53 PHOLADIDAE						8					16		
54 MAGELONA RIOJAI	56												
55 SPIOPHANES BOMBYX											8		
56 CEREBRATULUS LURIDUS						8							
57 NEPHTYS PICTA													
58 ANCISTROSYLLIS HARTMANAE								8		16			
59 MULINIA LATERALIS													
60 LUNARCA OVALIS		8				8							
61 MAGELONA ROSEA	8					8							
62 ODOSTOMIA GIBBOSA								8					
63 PAGURUS ANNULIPES													
64 INCERTAE SEDIS													
65 MICROPHOLIS ATRA													
66 MYSELLA PLANULATA							24						
67 ARICIDEA FRAGILIS													
68 LEPIDASTHENIA SP										8			
69 BOCCARDIA SP							8						
70 CALLINECTES SIMILIS													
71 NEREIS SUCCINEA													
72 TEREBELLIDAE													
73 SPIONIDAE							8						
74 PARAMYA SUBOVATA							272						
75 PELECYPODA	24												
76 ALBUNEA PARETII													
77 ANADARA TRANSVERSA													
78 AMPHARETE ACUTIFRONS							8						
79 AMPHIPODA A													
80 ANCISTROSYLLIS SP A													
81 ANCISTROSYLLIS SP C													

Table B3 (continued)

SPECIES	16	17	18	19	20	21	22	23	24	25	26	27	28
					STATIONS								
82 ANCISTROSYLLIS SETIGER									8				
83 ANEMONE A													
84 AUTOMATE EVERMANNI	8												
85 BASCANICHTHYS TERES													
86 CALLIANASSA ACANTHOCHIRUS						8							
87 CERATOCEPHALE SP.													8
88 DOSINIA DISCUS	8												
89 ELECTRA SP (COLONIES)													
90 GLYCERA SP													8
91 GPUREULEPIS SP													
92 HEPATUS EPHELITICUS													
93 LOVENELLA GRACILIS (COL)													
94 MARPHYSA ARANSENSIS													
95 MELINNA MACULATA													
96 NEPHTYS MAGELLANICA													
97 NOETIA PONDEROSA							8						
98 OXYUROSTYLIS SALINOI													
99 PANOPEUS TURGIDUS													
100 SIGAMBRA SETIGER													
101 TELLINA VERSICOLOR													
102 POLYNOIDAE													

TABLE B4
PILOT STUDY BENTHIC DATA:
NUMBER OF INDIVIDUALS/SQ.M. OF EACH SPECIES COLLECTED AT STATION 1 ON 17 APR 75

SURF TEMP	SURF SAL	BOT TEMP	BOT SAL	DEPTH	SED TEMP	TIME ON	TIME OFF
20.1	20.0		20.0	10.0		1505	9999

SEDIMENTS: HARD SAND

SPECIES	REPLICATES 1		2	
	ADLT	YNG	ADLT	YNG
1 PHORONIS ARCHITECTA	48		448	
2 PINNIXA LUNZI			192	
3 COROPHIUM ACHERUSICUM	96			
4 MAGELONA RIOJAI	80			
5 PARANTHUS RAPIFORMIS	48		32	
6 THALASSEMA HARTMANI			48	
7 NEPHTYS PICTA	32		16	
8 DIOPATRA CUPREA	16	16		
9 NEREIS SP	16		16	
10 AGLAOPHAMUS VERRILLI	32			
11 STHENELAIS BOA	32			
12 ALBUNEA PARETII	16		16	
13 NEMERTEA (YELLOW & PURPLE)	16		16	
14 NASSARIUS ACUTUS			32	
15 OWENIA FUSIFORMIS	16			
16 SPIONIDAE	16			
17 PHASCOLION STROMBI	16			
18 NEREIS SUCCINEA	16			
19 NOTOMASTUS HEMIPODUS			16	
20 LOVENELLA GRACILIS (COL)	16			
TOTAL NUMBER OF INDIVIDUALS	512	16	832	

TABLE B5
PILOT STUDY BENTHIC DATA:
NUMBER OF INDIVIDUALS/SQ.M. OF EACH SPECIES COLLECTED AT STATION 2 ON 17 APR 75

SURF TEMP	SURF SAL	BOT TEMP	BOT SAL	DEPTH	SED TEMP	TIME ON	TIME OFF
20.5	23.0		23.0	11.4		1650	1715

SEDIMENTS: BROWN SAND OVER GRAY CLAY

SPECIES	REPLICATES 1 ADLT	1 YNG	2 ADLT	2 YNG
1 MULINIA LATERALIS			16	
2 NEREIS SP	176		16	
3 MAGELONA SP	144			
4 PRIONOSPIO PINNATA	16		112	
5 COROPHIUM ACHERUSICUM	112			
6 MEDIOMASTUS CALIFORNIENSIS	64		32	
7 LUMBRINERIS TENUIS		48		48
8 NASSARIUS ACUTUS	16		32	
9 NOTOMASTUS HEMIPODUS	48			
10 GLYCERA AMERICANA	16		16	16
11 DIOPATRA CUPREA	16		16	
12 MICROPHOLIS ATRA	32			
13 NATICA PUSILLA			32	
14 TEREBRA PROTEXTA	16			
15 NEREIS SUCCINEA	16			
16 LEPIDONOTUS SUBLEVIS	16			
17 CALLINECTES SIMILIS	16			
18 PINNIXA CRISTATA	16			
19 NOTOMASTUS LATERICEUS			16	
20 NEMERTEA (YELLOW BANDED)			16	
21 PHASCOLION STROMBI			16	
22 PHORONIS ARCHITECTA			16	
23 CEREBRATULUS LACTEUS			16	
TOTAL NUMBER OF INDIVIDUALS	720	48	352	64

1

TABLE B6
PILOT STUDY BENTHIC DATA:
NUMBER OF INDIVIDUALS/SQ.M. OF EACH SPECIES COLLECTED AT STATION 3 ON 18 APR 75

SURF TEMP	SURF SAL	BOT TEMP	BOT SAL	DEPTH	SED TEMP	TIME ON	TIME OFF
	16.0			12.6		900	9999

SEDIMENTS: BROWN SANDY MUD OVER GRAY CLAY

	SPECIES	REPLICATES 1		2	
		ADLT	YNG	ADLT	YNG
1	PRIONOSPIO PINNATA	64		224	
2	BALANOGLOSSUS	128		48	
3	CEREBRATULUS LACTEUS	64		112	
4	NASSARIUS ACUTUS	48		32	32
5	PHASCOLION STROMBI	80		32	
6	DIOPATRA CUPREA	80		32	
7	GLYCINDE SOLITARIA	48		64	
8	CLYMENELLA ZONALIS	32		48	
9	NEREIS SP	32		32	
10	SIGAMBRA WASSI	48		16	
11	TEREBRA PROTEXTA	48			
12	SIGAMBRA TENTACULATA	32		16	
13	MAGELONA SP	16		32	
14	LUMBRINERIS TENUIS		16		32
15	NEMERTEA (YELLOW & PURPLE)	16		16	
16	ABRA AEQUALIS	16			
17	AGLAOPHAMUS VERRILLI	16			
18	SIGAMBRA BASSI	16			
19	NEMERTEA (YELLOW BANDED)	16			
20	GLYCERA AMERICANA	16			
21	ANACHIS OBESA			16	
22	COROPHIUM ACHERUSICUM			16	
23	ANCISTROSYLLIS SP A			16	
	TOTAL NUMBER OF INDIVIDUALS	816	16	752	64

TABLE B7
PILOT STUDY BENTHIC DATA:
NUMBER OF INDIVIDUALS/SQ.M. OF EACH SPECIES COLLECTED AT STATION 4 ON 15 APR 75

SURF TEMP	SURF SAL	BOT TEMP	BOT SAL	DEPTH	SED TEMP	TIME ON	TIME OFF
19.0				12.6		1300	1345

SEDIMENTS: SOFT MUD OVERLYING GRAY CLAY

SPECIES	REPLICATES 1 ADLT	1 YNG	2 ADLT	2 YNG
1 BALANOGLOSSUS	528		384	
2 CEREBRATULUS LACTEUS	80		80	
3 LUMBRINERIS TENUIS		48		16
4 SIGAMBRA WASSI	48		16	
5 MAGELONA SP	48			
6 NEMERTEA (YELLOW BANDED)	48			
7 PRIONOSPIO PINNATA	16		32	
8 PSEUDEURYTHOE AMBIGUA			48	
9 DIOPATRA CUPREA	16		16	
10 GLYCINDE SOLITARIA	16		16	
11 NINOE NIGRIPES	16		16	
12 PINNIXA CRISTATA	16			16
13 CLYMENELLA ZONALIS	32			
14 AMPELISCA ABDITA	32			
15 NASSARIUS ACUTUS	16			
16 NEPHTYS MAGELLANICA	16			
17 OXYUROSTYLIS SALINOI	16			
18 STHENELAIS BOA			16	
19 NOTOMASTUS LATERICEUS			16	
20 GLYCERA AMERICANA				16
21 COROPHIUM ACHERUSICUM			16	
TOTAL NUMBER OF INDIVIDUALS	944	48	656	48

TABLE B8
PILOT STUDY BENTHIC DATA:
NUMBER OF INDIVIDUALS/SQ.M. OF EACH SPECIES COLLECTED AT STATION 5 ON 15 APR 75

SURF TEMP	SURF SAL	BOT TEMP	BOT SAL	DEPTH	SED TEMP	TIME ON	TIME OFF
18.0				12.6		1030	1100

SEDIMENTS: SOFT MUD OVERLYING GRAY CLAY

SPECIES	REPLICATES 1 ADLT	1 YNG	2 ADLT	2 YNG
1 BALANOGLOSSUS			416	
2 DIOPATRA CUPREA	32		16	
3 NUCULANA CONCENTRICA	16			
4 GLYCINDE SOLITARIA	16			
5 SIGAMBRA TENTACULATA	16			
6 PHASCOLION STROMBI			16	
7 NASSARIUS ACUTUS			16	
8 GLYCERA AMERICANA				16
9 PRIONOSPIO PINNATA			16	
TOTAL NUMBER OF INDIVIDUALS	80		480	16

TABLE B9
PILOT STUDY BENTHIC DATA:
NUMBER OF INDIVIDUALS/SQ.M. OF EACH SPECIES COLLECTED AT STATION 6 ON 17 APR 75

SURF TEMP	SURF SAL	BOT TEMP	BOT SAL	DEPTH	SED TEMP	TIME ON	TIME OFF
20.0	23.0		23.0	14.4		1040	1102

SEDIMENTS: GRAY CLAY. FINE SEDIMENT ON TOP. PATCHES OF SAND

SPECIES	REPLICATES 1		2	
	ADLT	YNG	ADLT	YNG
1 BALANOGLOSSUS	272			
2 DIOPATRA CUPREA	16	32	32	32
3 CEREBRATULUS LACTEUS	32		16	
4 NASSARIUS ACUTUS	16		16	
5 NUCULANA CONCENTRICA			16	16
6 SIGAMBRA WASSI			32	
7 PRIONOSPIO PINNATA			32	
8 SIGAMBRA TENTACULATA	16			
9 NEPHTYS INCISA			16	
10 GLYCINDE SOLITARIA			16	
TOTAL NUMBER OF INDIVIDUALS	352	32	176	48

TABLE B10
PILOT STUDY BENTHIC DATA:
NUMBER OF INDIVIDUALS/SQ.M. OF EACH SPECIES COLLECTED AT STATION 7 ON 16 APR 75

SURF TEMP	SURF SAL	BOT TEMP	BOT SAL	DEPTH	SED TEMP	TIME ON	TIME OFF
20.0	20.0			15.0		1130	1215

SEDIMENTS: GRAY CLAY

SPECIES	REPLICATES 1 ADLT	1 YNG	2 ADLT	2 YNG
1 BALANOGLOSSUS	2080		1432	
2 MYSELLA SP			240	
3 CEREBRATULUS LACTEUS	112		80	
4 GLYCERA AMERICANA	80		80	
5 PRIONOSPIO PINNATA	80		64	
6 PHASCOLION STROMBI	112			
7 LUMBRINERIS TENUIS		16		64
8 NEREIS SP	64			
9 NEMERTEA (YELLOW BANDED)	32		32	
10 NINOE NIGRIPES			48	
11 ARMANDIA AGILIS	16		32	
12 SIGAMBRA WASSI			48	
13 CLYMENELLA ZONALIS			48	
14 ARICIDEA FRAGILIS	16		32	
15 DIOPATRA CUPREA	16			16
16 SIGAMBRA TENTACULATA	32			
17 AMPELISCA ABDITA			32	
18 MICROPHOLIS ATRA	16		16	
19 STHENELAIS BOA	16			
20 MALDANIDAE	16			
21 BOCCARDIA SP	16			
22 NOTOMASTUS HEMIPODUS			16	
23 SIGAMBRA SETIGER			16	
24 PHORONIS ARCHITECTA			16	
25 COSSURA DELTA			16	
26 ABRA AEQUALIS			16	
27 ANACHIS OBESA			16	
28 PINNIXA CRISTATA				16

TABLE B11
PILOT STUDY BENTHIC DATA:
NUMBER OF INDIVIDUALS/SQ.M. OF EACH SPECIES COLLECTED AT STATION 8 ON 17 APR 75

SURF TEMP	SURF SAL	BOT TEMP	BOT SAL	DEPTH	SEC TEMP	TIME ON	TIME OFF
20.0	22.0		22.0	10.0		1445	1500

SEDIMENTS: SAND OVER GRAY CLAY

SPECIES	REPLICATES 1 ADLT	1 YNG	2 ADLT	2 YNG
1 PHORONIS ARCHITECTA	128		288	
2 NEREIS SP	112		32	
3 MAGELONA SP	16		128	
4 SPIOPHANES BOMBYX			112	
5 NOTOMASTUS HEMIPODUS			96	
6 NASSARIUS ACUTUS	80			
7 NEMERTEA (YELLOW BANDED)	16		48	
8 COROPHIUM ACHERUSICUM	32		16	
9 AGLAOPHAMUS VERRILLI	16		16	
10 PARANTHUS RAPIFORMIS			16	16
11 GLYCERA AMERICANA		16		
12 STHENELAIS BOA	16			
13 NATICA PUSILLA			16	
14 PRIONOSPIO PINNATA			16	
15 NEPHTYS PICTA			16	
16 DIOPATRA CUPREA			16	
17 MALDANIDAE			16	
18 GRUBELLEPIS SP			16	
TOTAL NUMBER OF INDIVIDUALS	416	16	848	16

TABLE B12
PILOT STUDY BENTHIC DATA:
NUMBER OF INDIVIDUALS/SQ.M. OF EACH SPECIES COLLECTED AT STATION 9 ON 17 APR 75

SURF TEMP	SURF SAL	BOT TEMP	BOT SAL	DEPTH	SED TEMP	TIME ON	TIME OFF
20.6	24.0		24.0	11.4		1625	1645

SEDIMENTS: FINE BROWN SAND OVER GRAY CLAY. DIOPATRA TUBES COVER W//SHELL. LOTS OF SHELL

SPECIES	REPLICATES 1		2	
	ADLT	YNG	ADLT	YNG
1 PHORONIS ARCHITECTA	1440		1520	
2 PRIONOSPIO PINNATA	192		224	
3 NASSARIUS ACUTUS	64		224	
4 BALANOGLOSSUS			272	
5 OWENIA FUSIFORMIS	112	80	48	
6 CLYMENELLA ZONALIS	192		48	
7 LUMBRINERIS TENUIS	16	64		112
8 GLYCERA AMERICANA	64		64	32
9 NOTOMASTUS LATERICEUS	32		112	
10 NEMERTEA (YELLOW BANDED)	48		96	
11 PSEUDEURYTHOE AMBIGUA			144	
12 PHASCOLION STROMBI	48		64	
13 DIOPATRA CUPREA	48		48	
14 MEDIOMASTUS CALIFORNIENSIS	64		32	
15 CEREBRATULUS LACTEUS	32		64	
16 TEREBRA PROTEXTA	32		48	
17 SPIOPHANES BOMBYX			80	
18 PAGURUS ANNULIPES	16		48	
19 COROPHIUM ACHERUSICUM	32		16	
20 NEPHTYS PICTA	16			32
21 ANADARA TRANSVERSA	16			16
22 NEREIS SP	16		16	
23 AMPELISCA ABDITA	16		16	
24 SIGAMBRA TENTACULATA	16			16
25 MAGELONA SP			32	
26 GLYCINDE SOLITARIA	16			
27 ARICIDEA FRAGILIS	16			
28 ANCISTROSYLLIS SP C	16			

TABLE B13
PILOT STUDY BENTHIC DATA:
NUMBER OF INDIVIDUALS/SQ.M. OF EACH SPECIES COLLECTED AT STATION 10 ON 18 APR 75

SURF TEMP	SURF SAL	BOT TEMP	BOT SAL	DEPTH	SED TEMP	TIME ON	TIME OFF
17.0				12.6		950	1057

SEDIMENTS: SANDY CLAY - GRAY. LOT OF SHELL

SPECIES	REPLICATES 1 ADLT	1 YNG	2 ADLT	2 YNG
1 PRIONOSPIO PINNATA	192		32	
2 CEREBRATULUS LACTEUS	80		16	
3 MAGELONA SP	48		32	
4 LUMBRINERIS TENUIS		48		32
5 NASSARIUS ACUTUS	16		48	
6 SIGAMBRA WASSI	32		32	
7 NINOE NIGRIPES	48			
8 PHORONIS ARCHITECTA	22		16	
9 INCERTAE SEDIS	32		16	
10 GLYCINDE SOLITARIA	48			
11 CLYMENELLA ZONALIS	16		32	
12 NEMERTEA (YELLOW BANDED)	32			
13 ANCISTROSYLLIS (POST FRAG)	16		16	
14 GLYCERA AMERICANA		16	16	
15 ANACHIS OBESA	16			
16 AGLAOPHAMUS VERRILLI	16			
17 HEMIPHOLIS ELONGATA	16			
18 PHASCOLION STROMBI			16	
19 DIOPATRA CUPREA			16	
20 OWENIA FUSIFORMIS			16	
21 ELECTRA SP (COLONIES)	16			
TOTAL NUMBER OF INDIVIDUALS	656	64	304	32

TABLE B14
PILOT STUDY BENTHIC DATA:
NUMBER OF INDIVIDUALS/SQ.M. OF EACH SPECIES COLLECTED AT STATION 11 ON 15 APR 75

SURF TEMP	SURF SAL	BOT TEMP	BOT SAL	DEPTH	SED TEMP	TIME ON	TIME OFF
19.0				12.6		1405	1515

SEDIMENTS: SOFT MUD OVER GRAY CLAY

SPECIES	REPLICATES 1 ADLT	1 YNG	2 ADLT	2 YNG
1 LUMBRINERIS TENUIS	48	64		48
2 MAGELONA SP	64		64	
3 DIOPATRA CUPREA	64		32	
4 CEREBRATULUS LACTEUS	48		48	
5 HEMIPHOLIS ELONGATA	16		48	
6 NEREIS SP	64			
7 NEMERTEA (YELLOW BANDED)	16		32	
8 PHORONIS ARCHITECTA	32		16	
9 SIGAMBRA WASSI	32		16	
10 PRIONOSPIO PINNATA	16		32	
11 MULINIA LATERALIS		32		
12 LEPIDASTHENIA SP	16		16	
13 NINOE NIGRIPES			32	
14 NOTOMASTUS LATERICEUS	16		16	
15 COROPHIUM ACHERUSICUM			16	16
16 PINNIXA CRISTATA			32	
17 ASYCHIS ELONGATA			32	
18 MARPHYSA ARANSENSIS			16	
19 NASSARIUS ACUTUS			16	
20 TELLINA VERSICOLOR			16	
21 MEDIOMASTUS CALIFORNIENSIS	16			
22 HEPATUS EPHELITICUS	16			
23 GLYCERA AMERICANA	16			
24 NEMERTEA (YELLOW & PURPLE)	16			
25 GLYCINDE SOLITARIA	16			
26 MALDANIDAE	16			
27 TEREBELLIDAE	16			

TABLE B15
PILOT STUDY BENTHIC DATA:
NUMBER OF INDIVIDUALS/SQ.M. OF EACH SPECIES COLLECTED AT STATION 12 ON 3 MAY 75

SURF TEMP	SURF SAL	BOT TEMP	BOT SAL	DEPTH	SEC TEMP	TIME ON	TIME OFF
24.0	8.0			13.1		1000	1030

SEDIMENTS: GRAY CLAY OVERLAIN BY SOFT BROWN OXIDIZED MUD. NO SAND, VERY LITTLE SHELL.

SPECIES	REPLICATES 1		2	
	ADLT	YNG	ADLT	YNG
1 BALANOGLOSSUS	1008		3904	
2 CEREBRATULUS LACTEUS	112		160	
3 DIOPATRA CUPREA	48	32	64	
4 POLYDORA SP A			144	
5 PRIONOSPIO PINNATA	16		32	
6 SIGAMBRA TENTACULATA	16		16	
7 SIGAMBRA WASSI	16		16	
8 NEMERTEA (YELLOW BANDED)	32			
9 CIRRATULUS HEDGPETHI		32		
10 CLYMENELLA ZONALIS	16			
11 GLYCINDE SOLITARIA	16			
12 HEMIPHOLIS ELONGATA	16			
13 ARMANDIA AGILIS	16			
14 PSEUDEURYTHOE AMBIGUA			16	
15 NEMERTEA (YELLOW & PURPLE)			16	
16 GLYCERA AMERICANA			16	
17 AMPHARETE (EYES)			16	
18 LUMBRINERIS TENUIS				16
19 NASSARIUS ACUTUS			16	
TOTAL NUMBER OF INDIVIDUALS	1312	64	4416	16

TABLE B16
PILOT STUDY BENTHIC DATA:
NUMBER OF INDIVIDUALS/SQ.M. OF EACH SPECIES COLLECTED AT STATION 13 ON 17 APR 75

SURF TEMP	SURF SAL	BOT TEMP	BOT SAL	DEPTH	SED TEMP	TIME ON	TIME OFF
20.0		19.0		12.6	19.0	1000	1025

SEDIMENTS: SOFT MUD OVER GRAY CLAY

SPECIES	REPLICATES 1 ADLT	1 YNG	2 ADLT	2 YNG
1 BALANOGLOSSUS	528		16	
2 MAGELONA SP	128		224	
3 CEREBRATULUS LACTEUS	16		320	
4 PRIONOSPIO PINNATA	64		128	
5 PINNIXA CRISTATA		48		16
6 DIOPATRA CUPREA	16	16	32	
7 LUMBRINERIS TENUIS		16	16	16
8 TEREBRA PROTEXTA		32		
9 NEREIS SP	32			
10 NEPHTYS INCISA	32			
11 GLYCINDE SOLITARIA	16			
12 NINOE NIGRIPES	16			
13 SIGAMBRA WASSI	16			
14 ANCISTROSYLLIS (POST FRAG)	16			
15 SIGAMBRA TENTACULATA	16			
16 NASSARIUS ACUTUS			16	
17 GLYCERA AMERICANA			16	
18 COSSURA DELTA			16	
19 COROPHIUM ACHERUSICUM			16	
20 ABRA AEQUALIS			16	
21 CODSTOMIA GIBBOSA			16	
22 ANCISTROSYLLIS JONESI				16
23 MAGELONA ROSEA			16	
TOTAL NUMBER OF INDIVIDUALS	896	112	848	48

TABLE B17
PILOT STUDY BENTHIC DATA:
NUMBER OF INDIVIDUALS/SQ.M. OF EACH SPECIES COLLECTED AT STATION 14 ON 16 APR 75

SURF TEMP	SURF SAL	BOT TEMP	BOT SAL	DEPTH	SED TEMP	TIME ON	TIME OFF
19.5	18.0			15.0		1252	1340

SEDIMENTS: CLAY - SAND

SPECIES	REPLICATES			
	1		2	
	ADLT	YNG	ADLT	YNG
1 BALANOGLOSSUS	2592		2880	
2 PINNIXA CRISTATA	80	48		176
3 NASSARIUS ACUTUS			128	
4 CEREBRATULUS LACTEUS	64		48	
5 PRIONOSPIO PINNATA	80		16	
6 LUMBRINERIS TENUIS		16		32
7 MAGELONA SP	32		16	
8 PHORONIS ARCHITECTA	16		32	
9 TEREBRA PROTEXTA	16		16	
10 STHENELAIS BOA		16		
11 GLYCERA AMERICANA		16		
12 ASYCHIS ELONGATA	16			
13 CEREBRATULUS LURIDUS	16			
14 COSSURA DELTA	16			
15 NUCULANA CONCENTRICA				16
16 ABRA AEQUALIS			16	
17 PAGURUS ANNULIPES			16	
18 AMPELISCA ABDITA			16	
19 DIOPATRA CUPREA				16
20 INCERTAE SEDIS			16	
21 AMPHARETE (EYES)			16	
22 BASCANICHTHYS TERES	16			
TOTAL NUMBER OF INDIVIDUALS	2944	96	3216	240

TABLE B18
PILOT STUDY BENTHIC DATA:
NUMBER OF INDIVIDUALS/SQ.M. OF EACH SPECIES COLLECTED AT STATION 15 ON 15 APR 75

SURF TEMP	SURF SAL	BOT TEMP	BOT SAL	DEPTH	SED TEMP	TIME ON	TIME OFF
20.1	23.0		23.0	10.0		1230	1255

SEDIMENTS: GRAY SANDY CLAY

SPECIES	REPLICATES 1 ADLT	1 YNG	2 ADLT	2 YNG
1 PRIONOSPIO PINNATA	48		400	
2 NEREIS SP	208		16	
3 MAGELONA SP	128		32	
4 PHOLADIDAE		160		
5 CEREBRATULUS LURIDUS	16		112	
6 NEMERTEA (YELLOW BANDED)	64		16	
7 NOTOMASTUS LATERICEUS	80			
8 PHASCOLION STROMBI	16	16	32	
9 DIOPATRA CUPREA	16	16	16	
10 THALASSEMA HARTMANI	32		16	
11 MEDIOMASTUS CALIFORNIENSIS	32		16	
12 TEREBRA PROTEXTA	16	32		
13 PHORONIS ARCHITECTA	32		16	
14 AMPHARETE (EYES)	32	16		
15 NATICA PUSILLA			48	
16 COROPHIUM ACHERUSICUM	32			
17 AMPELISCA ABDITA	32			
18 LUMBRINERIS TENUIS		16		16
19 CLYMENELLA ZONALIS			32	
20 GLYCINDE SOLITARIA			32	
21 STHENELAIS BOA	16			
22 GLYCERA AMERICANA	16			
23 NOTOMASTUS HEMIPODUS	16			
24 PINNIXA LUNZI		16		
25 MALDANIDAE	16			
26 TEREBELLIDAE	16			
27 LEPIDONOTUS SUBLEVIS	16			
28 MYSELLA PLANULATA	16			

TABLE B19
PILOT STUDY BENTHIC DATA:
NUMBER OF INDIVIDUALS/SQ.M. OF EACH SPECIES COLLECTED AT STATION 16 ON 17 APR 75

SURF TEMP	SURF SAL	BOT TEMP	BOT SAL	DEPTH	SED TEMP	TIME ON	TIME OFF
20.5	24.0		24.0	10.8		1725	1740

SEDIMENTS: GRAY SANDY CLAY

SPECIES	REPLICATES 1 ADLT	1 YNG	2 ADLT	2 YNG
1 PHORONIS ARCHITECTA	320		832	
2 PRIONOSPIO PINNATA	576		320	
3 CEREBRATULUS LACTEUS	64		752	
4 DIOPATRA CUPREA	80	80	16	
5 PSEUDEURYTHOE AMBIGUA	16		112	
6 MAGELONA RIOJAI	64		48	
7 COSSURA DELTA	64		32	
8 NOTOMASTUS LATERICEUS	32		48	
9 COROPHIUM ACHERUSICUM	48			
10 AMPHARETE (EYES)	48			
11 SIGAMBRA WASSI			48	
12 PELECYPODA			48	
13 LUMBRINERIS TENUIS	16		16	16
14 PHASCOLION STROMBI	32			
15 NEMERTEA (YELLOW BANDED)	32			
16 AMPELISCA ABDITA	32			
17 CLYMENELLA ZONALIS		32		
18 STHENELAIS BOA	16		16	
19 PINNIXA CRISTATA			16	16
20 GLYCERA AMERICANA			16	16
21 PARANTHUS RAPIFORMIS	16			
22 NINOE NIGRIPES	16			
23 DOSINIA DISCUS		16		
24 MEDIOMASTUS CALIFORNIENSIS	16			
25 GLYCINDE SOLITARIA	16			
26 MAGELONA ROSEA	16			
27 ABRA AEQUALIS			16	
28 SPIOCHAETOPTERUS OCULATUS			16	

TABLE B20
PILOT STUDY BENTHIC DATA:
NUMBER OF INDIVIDUALS/SQ.M. OF EACH SPECIES COLLECTED AT STATION 17 ON 29 APR 75

SURF TEMP	SURF SAL	BOT TEMP	BOT SAL	DEPTH	SED TEMP	TIME ON	TIME OFF
23.0	12.0			21.6		1015	1140

SEDIMENTS: GRAY SANDY CLAY, NO SHELL

SPECIES	REPLICATES 1 ADLT	1 YNG	2 ADLT	2 YNG
1 BALANOGLOSSUS	16		128	
2 MAGELONA SP	16		128	
3 DIOPATRA CUPREA	48		48	
4 PRIONOSPIO PINNATA	16		80	
5 CEREBRATULUS LACTEUS	32		48	
6 PHASCOLION STROMBI	64		16	
7 SIGAMBRA WASSI	32		32	
8 GLYCINDE SOLITARIA	48		16	
9 NINOE NIGRIPES	32		16	
10 CLYMENELLA ZONALIS	32			
11 NEREIS SP			32	
12 LUMBRINERIS TENUIS		16		
13 SPIOCHAETOPTERUS OCULATUS	16			
14 ABRA AEQUALIS	16			
15 SIGAMBRA TENTACULATA	16			
16 PINNIXA CRISTATA	16			
17 NEMERTEA (YELLOW BANDED)	16			
18 CALLIANASSA LATISPINA		16		
19 LUNARCA OVALIS			16	
20 HEMIPHOLIS ELONGATA			16	
21 NEMERTEA (YELLOW & PURPLE)			16	
22 NASSARIUS ACUTUS			16	
TOTAL NUMBER OF INDIVIDUALS	416	32	608	

TABLE B21
PILOT STUDY BENTHIC DATA:
NUMBER OF INDIVIDUALS/SQ.M. OF EACH SPECIES COLLECTED AT STATION 18 ON 15 APR 75

SURF TEMP	SURF SAL	BOT TEMP	BOT SAL	DEPTH	SFC TEMP	TIME ON	TIME OFF
19.0				12.6		1545	1710

SEDIMENTS: SOFT MUD OVER GRAY CLAY

SPECIES	REPLICATES 1 ADLT	1 YNG	2 ADLT	2 YNG
1 DIOPATRA CUPREA	32	32	16	
2 SIGAMBRA WASSI	48		16	
3 CEREBRATULUS LACTEUS			64	
4 MAGELONA SP			32	
5 CALLIANASSA LATISPINA	16			
6 NINOE NIGRIPES	16			
7 PRIONOSPIO PINNATA			16	
8 PHASCOLION STROMBI			16	
TOTAL NUMBER OF INDIVIDUALS	112	32	160	

TABLE B22
PILOT STUDY BENTHIC DATA:
NUMBER OF INDIVIDUALS/SQ.M. OF EACH SPECIES COLLECTED AT STATION 19 ON 3 MAY 75

SURF TEMP	SURF SAL	BOT TEMP	BOT SAL	DEPTH	SED TEMP	TIME ON	TIME OFF
25.0	10.0			12.6	22.0	1420	1454

SEDIMENTS: GRAY CLAY OVERLAIN BY SOFT BROWN OXIDIZED MUD, NO SAND, LITTLE SHELL.

SPECIES	REPLICATES 1 ADLT	1 YNG	2 ADLT	2 YNG
1 BALANOGLOSSUS	8608		2176	
2 PRIONOSPIO PINNATA	112		16	
3 CEREBRATULUS LACTEUS	32		64	
4 SIGAMBRA WASSI	64		32	
5 SIGAMBRA TENTACULATA	64		16	
6 DIOPATRA CUPREA	16		32	
7 GYPTIS VITTATA	48			
8 NOTOMASTUS LATERICEUS	32			
9 NEPHTYS INCISA			16	
10 COSSURA DELTA	16			
11 GLYCINDE SOLITARIA		16		
12 MEDIOMASTUS CALIFORNIENSIS	16			
13 ASYCHIS ELONGATA	16			
14 ANCISTROSYLLIS JONESI	16			
TOTAL NUMBER OF INDIVIDUALS	9040	16	2352	

TABLE B23
PILOT STUDY BENTHIC DATA:
NUMBER OF INDIVIDUALS/SQ.M. OF EACH SPECIES COLLECTED AT STATION 20 ON 16 APR 75

SURF TEMP	SURF SAL	BOT TEMP	BOT SAL	DEPTH	SED TEMP	TIME ON	TIME OFF
20.0	22.0			12.6		1645	1805

SEDIMENTS: GRAY CLAY

SPECIES	REPLICATES 1 ADLT	1 YNG	2 ADLT	2 YNG
1 BALANOGLOSSUS	1008		1440	
2 CEREBRATULUS LACTEUS	48		48	
3 DIOPATRA CUPREA	64		16	
4 PRIONOSPIO PINNATA	48		16	
5 SIGAMBRA TENTACULATA	32		16	
6 LEPIDONOTUS SUBLEVIS			32	
7 CALLIANASSA LATISPINA	16			
8 SIGAMBRA WASSI			16	
9 ANCISTROSYLLIS (POST FRAG)			16	
TOTAL NUMBER OF INDIVIDUALS	1216		1600	

TABLE B24
PILOT STUDY BENTHIC DATA:
NUMBER OF INDIVIDUALS/SQ.M. OF EACH SPECIES COLLECTED AT STATION 21 ON 16 APR 75

SURF TEMP	SURF SAL	BOT TEMP	BOT SAL	DEPTH	SED TEMP	TIME ON	TIME OFF
20.0	24.0			15.0		1352	1415

SEDIMENTS: THICK CLAY

SPECIES	REPLICATES 1 ADLT	1 YNG	2 ADLT	2 YNG
1 PRIONOSPIO PINNATA	448		224	
2 BALANOGLOSSUS	80		368	
3 DIOPATRA CUPREA	128		112	
4 CEREBRATULUS LACTEUS	80		64	
5 MAGELONA SP	80		64	
6 LUMBRINERIS TENUIS		32		64
7 POLYDORA SP A			80	
8 SIGAMBRA TENTACULATA	48			
9 NEREIS SP	16		32	
10 GLYCINDE SOLITARIA	32			
11 PHORONIS ARCHITECTA			32	
12 AMPELISCA ABDITA	16			
13 ANCISTROSYLLIS JONESI	16			
14 PHOLADIDAE			16	
15 ASYCHIS ELONGATA			16	
16 CALLIANASSA LATISPINA		16		
17 CALLIANASSA ACANTHOCHIRUS	16			
18 CEREBRATULUS LURIDUS			16	
19 CIRRATULUS HEDGPETHI	16			
20 GLYCERA AMERICANA	16			
21 GYPTIS VITTATA	16			
22 LUNARCA OVALIS	16			
23 MAGELONA ROSEA	16			
24 NEMERTEA (YELLOW BANDED)	16			
25 NUCULANA CONCENTRICA	16			
26 PSEUDEURYTHOE AMBIGUA			16	
27 SIGAMBRA WASSI	16			

TABLE B25
PILOT STUDY BENTHIC DATA:
NUMBER OF INDIVIDUALS/SQ.M. OF EACH SPECIES COLLECTED AT STATION 22 ON 17 APR 75

SURF TEMP	SURF SAL	BOT TEMP	BOT SAL	DEPTH	SED TEMP	TIME ON	TIME OFF
20.0	24.0			10.0		1305	1400

SEDIMENTS: HARD GRAY CLAY - NUMEROUS ECHIURIDS

SPECIES	REPLICATES 1 ADLT	1 YNG	2 ADLT	2 YNG
1 THALASSEMA HARTMANI	400		576	
2 PARAMYA SUBOVATA	240	96	208	
3 PSEUDEURYTHOE AMBIGUA	320			
4 SIGAMBRA WASSI			288	
5 PRIONOSPIO PINNATA	16		208	
6 LEPIDONOTUS SUBLEVIS	64		160	
7 PHORONIS ARCHITECTA	192		32	
8 CEREBRATULUS LACTEUS	176		16	
9 NOTOMASTUS LATERICEUS	144		48	
10 PINNIXA LUNZI			96	48
11 NASSARIUS ACUTUS	96		32	
12 PINNIXA CRISTATA	32	48		
13 GLYCERA AMERICANA	48		16	
14 CLYMENELLA ZONALIS			64	
15 MYSELLA PLANULATA	48			
16 SPIOCHAETOPTERUS OCULATUS	16		16	
17 TEREBRA PROTEXTA	16		16	
18 MAGELONA SP	16		16	
19 PHASCOLION STROMBI	16		16	
20 NEREIS SP			32	
21 ANACHIS OBESA			32	
22 DIOPATRA CUPREA			16	16
23 NATICA PUSILLA	16			
24 ABRA AEQUALIS	16			
25 GLYCINDE SOLITARIA	16			
26 BALANOGLOSSUS	16			
27 NOETIA PONDEROSA		16		
[illegible]			16	

TABLE B26
PILOT STUDY BENTHIC DATA:
NUMBER OF INDIVIDUALS/SQ.M. OF EACH SPECIES COLLECTED AT STATION 23 ON 17 APR 75

SURF TEMP	SURF SAL	BOT TEMP	BOT SAL	DEPTH	SED TEMP	TIME ON	TIME OFF
20.0	26.0			10.8		1742	1805

SEDIMENTS: SOFT MUD OVER GRAY CLAY

SPECIES	REPLICATES 1 ADLT	1 YNG	2 ADLT	2 YNG
1 BALANOGLOSSUS	3168		1936	
2 PRIONOSPIO PINNATA	176		144	
3 LUMBRINERIS TENUIS	16	112	16	64
4 CEREBRATULUS LACTEUS	64		96	
5 GLYCERA AMERICANA	48		48	16
6 PHASCOLION STROMBI	80		16	
7 MAGELONA SP	64		16	
8 DIOPATRA CUPREA	32		16	16
9 PINNIXA CRISTATA		48	16	
10 COSSURA DELTA	32		16	
11 SIGAMBRA TENTACULATA	48			
12 PSEUDEURYTHOE AMBIGUA	16		32	
13 TEREBRA PROTEXTA	32			
14 NINOE NIGRIPES	32			
15 SPIOCHAETOPTERUS OCULATUS	16		16	
16 NOTOMASTUS LATERICEUS	16		16	
17 PHORONIS ARCHITECTA	16		16	
18 PARANTHUS RAPIFORMIS	16		16	
19 CLYMENELLA ZONALIS	16		16	
20 ABRA AEQUALIS	16			
21 ANCISTROSYLLIS HARTMANAE	16			
22 ANCISTROSYLLIS (POST FRAG)			16	
23 NATICA PUSILLA			16	
24 NEMERTEA (YELLOW BANDED)	16			
25 NEREIS SP	16			
26 ODOSTOMIA GIBBOSA	16			
27 OWENIA FUSIFORMIS			16	
28 [illegible]			16	

TABLE B27
PILOT STUDY BENTHIC DATA:
NUMBER OF INDIVIDUALS/SQ.M. OF EACH SPECIES COLLECTED AT STATION 24 ON 29 APR 75

SURF TEMP	SURF SAL	BOT TEMP	BOT SAL	DEPTH	SED TEMP	TIME ON	TIME OFF
24.0	11.0			21.6		1325	1420

SEDIMENTS: BROWN SILT OVER GRAY CLAY. SAND LAYERS UNDERLYING CLAY

SPECIES	REPLICATES 1		2	
	ADLT	YNG	ADLT	YNG
1 BALANOGLOSSUS	640		528	
2 PINNIXA CRISTATA	160	16	32	
3 MAGELONA SP			64	
4 NASSARIUS ACUTUS	48			
5 LUMBRINERIS TENUIS	16	16	16	
6 PRIONOSPIO PINNATA	16		16	
7 SIGAMBRA TENTACULATA	16		16	
8 CEREBRATULUS LACTEUS	16		16	
9 DIOPATRA CUPREA	16			16
10 GYPTIS VITTATA			32	
11 AMPELISCA ABDITA	16			
12 NUCULANA CONCENTRICA			16	
13 PHASCOLION STROMBI			16	
14 SIGAMBRA WASSI			16	
15 TEREBRA PROTEXTA			16	
16 ANCISTROSYLLIS SETIGER	16			
17 GLYCINDE SOLITARIA			16	
18 MEDIOMASTUS CALIFORNIENSIS			16	
TOTAL NUMBER OF INDIVIDUALS	960	32	816	16

TABLE B28
PILOT STUDY BENTHIC DATA:
NUMBER OF INDIVIDUALS/SQ.M. OF EACH SPECIES COLLECTED AT STATION 25 ON 29 APR 75

SURF TEMP	SURF SAL	BOT TEMP	BOT SAL	DEPTH	SED TEMP	TIME ON	TIME OFF
24.0	13.0			24.3		1430	1650

SEDIMENTS: BROWN SILT OVER GRAY CLAY

SPECIES	REPLICATES 1 ADLT	1 YNG	2 ADLT	2 YNG
1 BALANOGLOSSUS	304		96	
2 DIOPATRA CUPREA	96		80	
3 SIGAMBRA WASSI	48		96	
4 CEREBRATULUS LACTEUS	80		64	
5 PRIONOSPIO PINNATA	112		16	
6 ANCISTROSYLLIS JONESI	96			
7 PINNIXA CRISTATA	32			
8 LUMBRINERIS TENUIS		16		16
9 ANCISTROSYLLIS HARTMANAE	32			
10 SIGAMBRA TENTACULATA	32			
11 HEMIPHOLIS ELONGATA			16	
12 LEPIDASTHENIA SP	16			
13 NOTOMASTUS HEMIPODUS	16			
14 PARANTHUS RAPIFORMIS			16	
15 SIGAMBRA BASSI	16			
16 MAGELONA SP	16			
TOTAL NUMBER OF INDIVIDUALS	896	16	384	16

TABLE B29
PILOT STUDY BENTHIC DATA:
NUMBER OF INDIVIDUALS/SQ.M. OF EACH SPECIES COLLECTED AT STATION 26 ON 3 MAY 75

SURF TEMP	SURF SAL	BOT TEMP	BOT SAL	DEPTH	SED TEMP	TIME ON	TIME OFF
29.5	11.0			12.6		1315	1345

SEDIMENTS: GRAY CLAY OVERLAIN BY OXIDIZED BROWN MUD, SOME SHELL, NO SAND

SPECIES	REPLICATES 1		2	
	ADLT	YNG	ADLT	YNG
1 BALANOGLOSSUS	464		3488	
2 CEREBRATULUS LACTEUS	48		128	
3 ARMANDIA AGILIS			128	
4 PRIONOSPIO PINNATA	32		64	
5 GLYCERA AMERICANA		16		64
6 GYPTIS VITTATA	16		64	
7 DIOPATRA CUPREA			32	48
8 MAGELONA SP			64	
9 ANCISTROSYLLIS JONESI			48	
10 SIGAMBRA TENTACULATA	16	16	16	
11 COROPHIUM ACHERUSICUM	32			
12 NASSARIUS ACUTUS	32			
13 PHOLADIDAE		16	16	
14 SIGAMBRA BASSI			32	
15 SIGAMBRA WASSI	32			
16 AMPELISCA ABDITA			16	
17 CIRRATULUS HEDGPETHI	16			
18 MEDIOMASTUS CALIFORNIENSIS	16			
19 LUMBRINERIS TENUIS	16			
20 NEPHTYS INCISA	16			
21 THALASSEMA HARTMANI			16	
22 PSEUDEURYTHOE AMBIGUA			16	
23 SPIOPHANES BOMBYX			16	
TOTAL NUMBER OF INDIVIDUALS	736	48	4144	112

TABLE B30
PILOT STUCY BENTHIC DATA:
NUMBER CF INCIVIDUALS/SQ.M. OF EACH SPECIES COLLECTED AT STATION 27 CN 16 APR 75

SURF TEMP	SURF SAL	BOT TEMP	BOT SAL	DEPTH	SED TEMP	TIME ON	TIME OFF
20.0	23.0			12.6		1610	1630

SEDIMENTS: SOFT MUD OVER GRAY CLAY

SPECIES	REPLICATES 1 ADLT	1 YNG	2 ADLT	2 YNG
1 BALANOGLOSSUS	880		1280	
2 PRIONOSPIO PINNATA	336		64	
3 CEREBRATULUS LACTEUS	32		96	
4 NASSARIUS ACUTUS			48	
5 DIOPATRA CUPREA		16	32	
6 TEREBRA PROTEXTA	16	16	16	
7 PINNIXA CRISTATA	16	16		
8 LUMBRINERIS TENUIS		16		16
9 GLYCINDE SOLITARIA	16		16	
10 SIGAMBRA WASSI			32	
11 NEMERTEA (YELLOW BANDED)	16			
12 ANCISTROSYLLIS JONESI	16			
13 AMPELISCA ABDITA			16	
14 SIGAMBRA TENTACULATA			16	
TOTAL NUMBER OF INDIVIDUALS	1328	64	1616	16

TABLE B31
PILOT STUDY BENTHIC DATA:
NUMBER OF INDIVIDUALS/SQ.M. OF EACH SPECIES COLLECTED AT STATION 28 ON 17 APR 75

SURF TEMP	SURF SAL	BOT TEMP	BOT SAL	DEPTH	SED TEMP	TIME ON	TIME OFF
20.0	21.0			15.0		1455	1515

SEDIMENTS: FINE MUD OVER GRAY CLAY

SPECIES	REPLICATES 1 ADLT	1 YNG	2 ADLT	2 YNG
1 BALANOGLOSSUS	2048		3424	
2 PRIONOSPIO PINNATA	48		160	
3 DIOPATRA CUPREA	80	32	64	16
4 CEREBRATULUS LACTEUS	48		32	
5 PINNIXA CRISTATA	64			16
6 SIGAMBRA TENTACULATA	32		32	
7 HEMIPHOLIS ELONGATA			48	
8 AMPELISCA ABDITA			32	
9 ARMANDIA AGILIS			32	
10 NUCULANA CONCENTRICA			32	
11 NOTOMASTUS LATERICEUS			32	
12 SPIOCHAETOPTERUS OCULATUS	16			
13 NEPHTYS INCISA	16			
14 CERATOCEPHALE SP.	16			
15 CIRRATULUS HEDGPETHI	16			
16 PHASCOLION STROMBI	16			
17 POLYDORA SP A	16			
18 NEMERTEA (YELLOW BANDED)			16	
19 MAGELONA SP			16	
20 COSSURA DELTA			16	
21 GLYCERA SP			16	
22 NINOE NIGRIPES			16	
TOTAL NUMBER OF INDIVIDUALS	2416	32	3968	32

Table B32. **Numbers of benthic individuals/m^2 collected in 10 replicate samples at station 6 on 4 May 1975. Sample 8 was not included in the average.**

Time on: 1330 Surface temp: 24.0 Surface sal: 15.0 Depth: 14 m
Time off: 1400 Bottom temp: -- Bottom sal: --
Sed. temp: 22.5

Sediment: sand-mud

Species	Replicates 1	2	3	4	5	6	7	8	9	10	$\bar{x}$
Balanoglossus sp.	10800	15760	21664	7072	4240	6960	173		6192	5456	8965
Cerebratulus lacteus	208		80	48	48	96	96		32	112	80
Pinnixa cristata	64	32	16	48	16	48			64		32
Prionospio pinnata	48	80	240	144	112	16	80		64	48	94
Diopatra cuprea	48	16	64		32		96		32	32	36
Acetes americanus	48	16			16						9
Glycera americana	32	16	16	16	48	16	16		48	32	27
Sigambra tentaculata	32				48	16					11
Nuculana concentrica	32		48	32		16		NOTHING ALIVE		16	16
Nemertea, yellow band	16		48		144				128		27
Lumbrineris tenuis	16	80	144	48	64	48	32		32	48	53
Phoronis architecta	16		48	96	32	32	240		32	144	73
Magelona sp.	16	208	368	192	208	64	48		48	144	145
Glycinde solitaria	16		16	16	16						7
Nassarius acutus	16	32		16							7
Ampelisca abdita	16		16	16	16					48	12
Sthenelais boa		32								32	7
Lepidasthenia sp.		32				32				48	11
Terebra protexta		16	32	16	32					32	14
Nereis sp.			80	96	48	16	144		16	64	52
Ninoe nigripes			64	16	16	16	48				18
Clymenella zonalis			48				16				7
Ampharate acutifrons			48	16	32		32				14
Abra aequalis			32	16							5

(continued)

Table B32 (concluded)

Species	Replicates 1	2	3	4	5	6	7	8	9	10	$\bar{x}$
Callianassa latispina			16					NOTHING ALIVE			2
Armandia agilis			16								2
Mediomastus californiensis			16			16					4
Nephtys magellanica			16							16	4
Pseudeurythoe ambigua			16								2
Gyptis vittata			16	16							4
Anaitides erythrophyllus			16								2
Notomastus latericeus			16		16						4
Nemertea, yellow and purple				64							7
Clymenella torquata calida				16							2
Ampharete sp. A				16							2
Prionospio cirrifera				16							2
Notomastus hemipodus				16	16		16				5
Cossura delta					48						5
Sigambra wassi						32				32	7
Ancistrosyllis jonesi						16					2
Lepidonotus sublevis						16					2
Asychis elongata							32				4
Anadara transversa							16				2
Phascolion strombi							16				2
Turbonilla interrupta									16		2
Corbula barrattania									16		2
Automate evermanni									16		2
Pinnixa lunzi										96	11
Ampithoe sp.										32	4
Thalassema hartmani										16	2
Listriella sp.										16	2
Macoma tenta										16	2
Total species	16	13	27	23	21	17	16		14	21	19
Total indiv./m2	11424	16320	23200	8048	5248	7456	1101		6736	6480	9244

Table B33. Numbers of benthic individual/m^2 collected in 10 replicate samples from station 17 on 4 May 1975. The data from samples 9 and 10 are suspect.

Time on: 1605 Surface temp: 24.0 Surface sal: 13.0 Depth: 12 m
Time off: 1650 Bottom temp: -- Bottom sal: --
Sed. temp: 22.5

Sediment: muddy sand

	Replicates										
Species	1	2	3	4	5	6	7	8	9	10	$\bar{x}$
Balanoglossus sp.	160	144	160	16	16	64	16	128	96		80
Cerebratulus lacteus	64	32	32	32	16	48		80	16	16	34
Lumbrineris tenuis	64	16	32	32	32		16	16			21
Prionospio pinnata	32	96	80	32	32				32		30
Nassarius acutus	16				32			64			11
Diopatra cuprea	16	16	16	16	16	16	32	16			8
Cossura delta	32	16	16					16			8
Nemertea, yellow band	16				16	32					6
Magelona sp.	16	32		64	16	16	32	48	32	16	27
Glycera americana	16	16	16		16			16			8
Sigambra wassi	16		16	16	32	16	16	80		16	19
Clymenella zonalis		16					16	16			6
Nephtys incisa		16									2
Nassarius acutus			16	16		16					6
Sigambra tentaculata			16			16					3
Ninoe nigripes					16	16					3
Pinnixa cristata					16			16			3
Terebellidae sp.					16						2
Cirratulus hedgpethi						16					2
Mediomastus californiensis							16	16			3
Spiochaetopterus oculatus							16				2
Hemipholis elongata								16			2
Ancistrosyllis sp.								16			2

(continued)

Table B33 (concluded)

Species	Replicates 1	2	3	4	5	6	7	8	9	10	$\bar{x}$
Anadara ovalis										16	2
Total species	11	10	10	8	13	10	8	14	4	4	9
Total indiv./m^2	448	400	400	224	272	256	160	544	176	64	294

Table B34. Number of benthic individuals/m^2 collected in 10 replicate samples at station 21 on 3 May 1975.

Time on: 1513 | Surface temp: 24/0 | Surface sal: 14.0 | Depth: 14 m
Time off: 1845 | Bottom temp: -- | Bottom sal: --
Sed temp: 22.5

Sediments: gray clay

Species	Replicates 1	2	3	4	5	6	7	8	9	10	$\bar{x}$
Balanoglossus sp.	3344	2208	7360	2880	2752	2368	5776	2368	5952	10565	4566
Ninoe nigripes	48	16		32	32	16	16	16	16	16	21
Glycera americana	112	96	96	96	32	80	208	80	64	64	93
Diopatra cuprea	48	64	48	32		32	48	32	160	64	53
Prionospio pinnata	256	96	48	224	64	64	16	32	176	128	110
Clymenella zonalis	16	16				32	32		32	16	14
Magelona sp.	176	48	48	96	80	112	80	112	144	64	96
Ampelisca abdita	80		32		16		16	32	144	64	38
Cossura delta	32			16	32	16	16	48	64		22
Aricidea fragilis	16										2
Mediomastus californiensis	48	32	32	32		16	16		48	32	26
Sigambra tentaculata	192	32	128	128	16	112	96	96	112	64	98
Armandia agilis	32	16	80	160	64	16	112	16	48	80	62
Lumbrineris tenuis	48	64		32	32	32	48	112	48	96	51
Cerebratulus lacteus	32	32	64	112	80	32	96		80	64	59
Gyptis vittata	16		16	32			16		32		11
Cirratulus hedgpethi	32	16	32	32		32	64		32		24
Nereis sp.	16	16		16	16						6
Phoronis architecta	80	32	160	32	32	64	16		144		56
Nassarius acutus	32										3
Lepidonotus sublevis	16		16								3
Hemipholis elongata	16								16		3
Sigambra wassi	32	32	32	16	32	16	64			32	26
Notomastus latericeus	48	16	32	16	96	16	48	16	16	48	35
Oxyurostylis salinoi	32										3
Ancistrosyllis hartmanae	32		16		16			16			8

(continued)

Table B34 (concluded)

Species	Replicates 1	2	3	4	5	6	7	8	9	10	$\bar{x}$
Ancistrosyllis jonesi	32	32	32	16			32	16	16	16	34
Prionospio cirrifera	16				16			16			5
Sigambra sp.	16										2
Sigambra bassi	16										2
Owenia fusiformis	16										2
Ampithoe sp.	16										2
Bunodactis texensis	16	16					16				5
Listriella sp.	16						16	16			5
Nemertea C		32	48				32				11
Callianassa latispina		16								16	3
Abra aequalis		16				16					3
Nemertea, yellow band		16	32	16	16	16	16	16	32	16	18
Paleonotus heteroseta			16	48							6
Spiochaetopterus oculatus			16	16							3
Pinnixa cristata			16	16	16		16		16	16	10
Paranthus rapiformis			16								2
Nemertea, yellow & purple			16				16				3
Magelona rosea			16							32	5
Anemone A			16								2
Sthenelais boa				16							2
Nephtys incisa				16							2
Nuculana concentrica					16						2
Ampharete acutifrons					16						2
Volvulella texasiana						16					2
Ampharete, eyes						16					2
Asychis elongata							16				2
Lepidasthenia sp.							16	16	16	16	6
Nereiphylla fragilis									16		6
Polydora socialis										16	2
Total species	34	23	27	25	21	21	28	18	24	22	24
Total indiv/m^2	4976	2960	8464	4128	3472	3120	6960	3056	7424	11525	5640

APPENDIX C

RAW NEKTON DATA FROM THE PILOT STUDY

Table C1. Taxonomic list of all nektonic and macro-epibenthic species collected in the offshore disposal area, Galveston, Texas, during the pilot study.

Cnidaria
- *Bunodactis texensis*
- *Calliactis tricolor*

Mollusca
- *Busycon contrarium*
- *Loliguncula brevis*
- *Lunarca ovalis*
- *Polinices duplicatus*
- *Thais haemastoma*
- Unknown gastropod

Crustacea
- *Acetes americanus*
- *Calinectes sapidus*
- *Callinectes similis*
- *Hepatus epheliticus*
- Mole crab
- *Ovalipes guadulpensis*
- *Pagurus longicarpus*
- *Panopeus herbsti*
- *Penaeus aztecus*
- *Penaeus setiferus*
- *Persephona aquilonaris*
- *Porcellana sayana*
- *Sicyonia dorsalis*
- *Squilla empusa*
- *Xiphopeneus krøyeri*

Osteichthys
- *Achirus lineatus*
- *Anchoa mitchilli*
- Ancylopsetta quadrocellata
- *Arius felis*
- *Astroscopus y-graecum*
- *Brevoortia patronus*
- *Citharichthys spilopterus*
- *Cynoscion arenarius*
- *Larimus fasciatus*
- Leiostomus xanthurus
- *Menticirrhus americanus*
- *Micropogon* undulatus
- *Peprilus burti*
- *Polydactylus octonemus*
- *Prionotus rubio*
- *Prionotus tribulus*

Osteichthys (continued)
- *Stellifer lanceolatus*
- *Symphurus civitatus*
- *Trichiurus lepturus*
- *Umbrina coroides*
- Unknown larval fish

Table C2. Numbers of individuals of the species collected in two replicate 5 minute trawls at pilot study trawl station 1 on 12 May 1975.

Species	Size Class (cm)	Replicates 1	Replicates 2	$\bar{x}$
VERTEBRATES				
Micropogon undulatus	< 10	148	146	147.0
	10-20	8	11	5.5
	TOTAL	156	157	156.5
Stellifer lanceolatus	< 10	179	121	150.0
	10-20	0	6	3.0
	TOTAL	179	127	153.0
Polydactylus octonemus	< 10	11	61	36.0
	10-20	0	1	0.5
	TOTAL	11	62	36.5
Cynoscion arenarius	< 10	14	30	20.5
	10-20	3	11	7.0
	TOTAL	17	41	27.5
Larimus fasciatus	< 10	1	9	5.0
	10-20	1	0	0.5
	TOTAL	2	9	5.5
Symphurus civitatus	< 10	3	5	4.0
Anchoa mitchilli	< 10	1	6	3.5
Trichiuris lepturus	10-20	0	4	2.0
	20-30	0	1	0.5
	TOTAL	0	5	2.5
Prionotus rubio	< 10	3	0	1.5
Leiostomus xanthurus	< 10	0	1	0.5
	10-20	0	2	1.0
	TOTAL	0	3	1.5
Menticirrhus americanus	10-20	1	1	1.0
Prionotus tribulus	10-20	0	1	0.5
Astroscopus y-graecum	< 10	1	0	0.5
Brevoortia patronus	< 10	0	1	0.5

Table C2 (continued)

Species	Size Class (cm)	Replicates 1	2	$\bar{X}$
NEKTONIC INVERTEBRATES				
Callinectes similis	< 10	109	83	96.0
Xiphopeneus krøyeri	< 10	70	55	62.5
	10-20	12	21	16.5
	TOTAL	82	76	79.0
Penaeus setiferus	< 10	34	19	26.5
Callinectes sapidus	< 10	0	9	4.5
	10-20	0	2	1.0
	TOTAL	0	11	5.5
Penaeus aztecus	< 10	3	2	2.5
	10-20	1	2	1.5
	TOTAL	4	4	4.0
Scyphozoa unID	< 10	1	1	1.0
Stomolophus meleagris	< 10	0	1	0.5
BENTHIC MACROINVERTEBRATES				
Pagurus longicarpus	< 10	3	0	1.5
Bunodactis texensis	< 10	2	0	1.0
Squilla empusa	< 10	0	1	0.5
Hepatus epheliticus	< 10	0	1	0.5
Mole crab	< 10	0	1	0.5
Actinaria unID	< 10	0	1	0.5
Summary				
Vertebrates				
species		10	12	11.0
individuals		374	418	396.0
Nektonic Invertebrates				
species		5	7	6.0
individuals		230	195	212.5
Benthic Macroinvertebrates				
species		2	4	3.0
individuals		5	4	4.5

Table C2 (continued)

Species	Size Class (cm)	Replicates 1	2	$\bar{X}$
Summary (con'd)				
Total				
species		17	23	20.0
individuals		609	617	613.0

The station: 27 spp.; 1226 ind.

Table C3. Numbers of individuals of the species collected in two replicate 5 minute trawls at pilot study trawl station 2 on 12 May 1975.

Species	Size Class (cm)	Replicates 1	Replicates 2	$\bar{X}$
VERTEBRATES				
Micropogon undulatus	< 10	106	121	113.5
	10-20	4	9	6.5
	TOTAL	110	130	120.0
Stellifer lanceolatus	< 10	67	133	100.0
	10-20	0	8	4.0
	TOTAL	67	141	104.0
Cynoscion arenarius	< 10	4	46	25.0
	10-20	50	25	37.5
	TOTAL	54	71	64.0
Polydactylus octonemus	< 10	59	54	56.5
Symphurus civitatus	< 10	3	11	7.0
Anchoa mitchilli	< 10	1	13	7.0
Unknown larval fish species	< 10	10	0	5.0
Larimus fasciatus	< 10	5	4	4.5
Prionotus rubio	< 10	1	6	3.5
Trichiuris lepturus	10-20	2	2	2.0
	20-30	1	0	0.5
	30-40	1	0	0.5
	TOTAL	4	2	3.0
Peprilus burti	< 10	2	2	2.0
	10-20	0	1	0.5
	TOTAL	2	3	2.5
Astroscopus y-graecum	< 10	0	2	1.0
Leiostomus xanthurus	< 10	0	1	0.5
NEKTONIC INVERTEBRATES				
Callinectes similis	< 10	73	134	103.5
Penaeus setiferus	< 10	8	41	24.5
	10-20	1	0	0.5
	TOTAL	9	41	25.0

Table C3 (continued)

Species	Size Class (cm)	Replicates 1	2	$\bar{X}$
NEKTONIC INVERTEBRATES (con'd)				
Penaeus aztecus	< 10	5	9	7.0
	10-20	0	2	1.0
	TOTAL	5	11	8.0
Xiphopeneus krøyeri	< 10	4	2	3.0
	10-20	0	4	2.0
	TOTAL	4	6	5.0
Acetes americanus carolinae	< 10	2	3	2.5
Scyphozoa unID	< 10	2	2	2.0
Callinectes sapidus	10-20	1	0	0.5
Loliguncula brevis	< 10	0	1	0.5
BENTHIC MACROINVERTEBRATES				
Ovalipes guadulpensis	<10	1	1	1.0
Squilla empusa	<10	0	1	0.5
Hepatus epheliticus	<10	0	1	0.5
Persephona aquilonaris	<10	0	1	0.5
Pagurus longicarpus	<10	0	1	0.5
Summary				
Vertebrates				
species		11	12	11.5
individuals		316	438	377.0
Nektonic Invertebrates				
species		7	7	7.0
individuals		96	198	147.0
Benthic Macroinvertebrates				
species		1	5	3.0
individuals		1	5	3.0
Total				
species		19	24	21.5
individuals		413	641	527.0

The station: 26 spp.; 1054 ind.

Table C4. Numbers of individuals of the species collected in two replicate 5 minute trawls at pilot study trawl station 3 on 12 May 1975.

Species	Size Class (cm)	Replicates 1	Replicates 2	$\bar{X}$
VERTEBRATES				
Micropogon undulatus	< 10	87	568	327.5
	10-20	14	53	33.5
	TOTAL	101	621	361.0
Stellifer lanceolatus	< 10	115	292	203.5
	10-20	6	46	26.0
	TOTAL	121	338	229.5
Cynoscion arenarius	< 10	4	16	10.0
	10-20	9	106	57.5
	TOTAL	13	122	67.5
Symphurus civitatus	< 10	15	73	44.0
	10-20	0	3	1.5
	TOTAL	15	76	45.5
Leiostomus xanthurus	< 10	1	8	4.5
	10-20	0	4	2.0
	TOTAL	1	12	6.5
Polydactylus octonemus	< 10	0	6	3.0
	10-20	1	0	0.5
	TOTAL	1	6	3.5
Anchoa mitchilli	< 10	2	1	1.5
Prionotus rubio	< 10	0	2	1.0
Trichiuris lepturus	20-30	1	0	0.5
Peprilus burti	< 10	0	1	0.5
Larimus fasciatus	10-20	0	1	0.5
NEKTONIC INVERTEBRATES				
Callinectes similis	< 10	143	122	132.5
Penaeus setiferus	< 10	41	24	32.5
	10-20	0	3	1.5
	TOTAL	41	27	34.0
Xiphopeneus krøyeri	< 10	15	13	14.0
	10-20	10	11	10.5
	TOTAL	25	24	24.5

Table C4 (continued)

Species	Size Class (cm)	Replicates 1	2	$\bar{x}$
NEKTONIC INVERTEBRATES (con'd)				
Penaeus aztecus	< 10	2	16	9.0
	10-20	0	1	0.5
	TOTAL	2	17	9.5
Callinectes sapidus	10-20	0	1	0.5
Loliguncula brevis	< 10	1	4	2.5
BENTHIC MACROINVERTEBRATES				
Lunarca ovalis	< 10	5	0	2.5
Squilla empusa	< 10	1	2	1.5
Pagurus longicapus	< 10	1	1	1.0
Busycon contrarium	< 10	1	0	0.5
Thais haemastoma	< 10	1	0	0.5
Polinices duplicatus	< 10	1	0	0.5
Calliactis tricolor	< 10	0	1	0.5
Summary				
Vertebrates				
species		8	10	9.0
individuals		255	1180	717.5
Nektonic Invertebrates				
species		5	6	5.5
individuals		212	195	203.5
Benthic Macroinvertebrates				
species		6	3	4.5
individuals		10	4	7.0
Total				
species		19	19	19.0
individuals		477	1379	928.0

The station: 24 spp.; 1856 ind.

Table C5. Numbers of individuals of the species collected in two replicate 5 minute trawls at pilot study trawl station 4 on 12 May 1975.

Species	Size Class (cm)	Replicates 1	Replicates 2	$\bar{X}$
VERTEBRATES				
Micropogon undulatus	< 10	117	496	306.5
	10-20	13	214	113.5
	TOTAL	130	710	420.0
Stellifer lanceolatus	< 10	160	193	176.5
	10-20	6	11	8.5
	TOTAL	166	204	185.0
Cynoscion arenarius	< 10	19	21	20.0
	10-20	52	44	48.0
	TOTAL	71	65	68.0
Polydactylus octonemus	< 10	43	14	28.5
	10-20	1	0	0.5
	TOTAL	44	14	29.0
Leiostomus xanthurus	< 10	11	5	8.0
	10-20	5	4	4.5
	TOTAL	16	9	12.5
Anchoa mitchilli	< 10	8	9	8.5
Symphurus civitatus	< 10	3	4	3.5
Larimus fasciatus	< 10	2	2	2.0
	10-20	2	0	1.0
	TOTAL	4	2	3.0
Trichuris lepturis	10-20	5	0	2.5
	20-30	1	0	0.5
	TOTAL	6	0	3.0
Menticirrhus americanus	10-20	1	1	1.0
Prionotus rubio	< 10	0	1	0.5
Arius felis	10-20	0	1	0.5
NEKTONIC INVERTEBRATES				
Penaeus setiferus	< 10	27	26	26.5
Callinectes similis	< 10	33	19	26.0

Table C5 (continued)

Species	Size Class (cm)	Replicates 1	Replicates 2	$\bar{X}$
NEKTONIC INVERTEBRATES (con'd)				
Xiphopeneus krøyeri	< 10	1	0	0.5
	10-20	15	9	12.0
	TOTAL	16	9	12.5
Penaeus aztecus	< 10	3	17	10.0
	10-20	1	3	2.0
	TOTAL	4	20	12.0
Loliguncula brevis	< 10	0	2	1.0
Callinectes sapidus	< 10	0	1	0.5
Acetes americanus carolinae	< 10	1	0	0.5
BENTHIC MACROINVERTEBRATES				
Hepatus epheliticus	< 10	1	2	1.5
Porcellana sayana	< 10	1	0	0.5
Busycon contrarium	< 10	1	0	0.5
Summary				
Vertebrates				
species		10	11	10.5
individuals		449	1020	734.5
Nektonic invertebrates				
species		4	5	4.5
individuals		81	77	79.0
Benthic Macroinvertebrates				
species		3	1	2.0
individuals		3	2	2.5
Total				
species		17	17	17.0
individuals		533	1099	816.0

The station: 22 spp.; 1632 ind.

Table C6. Numbers of individuals of the species collected in two replicate 5 minute trawls at pilot study trawl station 5 on 12 May 1975.

Species	Size Class (cm)	Replicates 1	Replicates 2	$\bar{X}$
VERTEBRATES				
Micropogon undulatus	< 10	103	103	103.0
	10-20	3	3	3.0
	TOTAL	106	106	106.0
Symphurus civitatus	< 10	12	87	49.5
	10-20	0	8	4.0
	TOTAL	12	95	53.5
Cynoscion arenarius	< 10	5	2	3.5
	10-20	43	10	26.5
	TOTAL	48	12	30.0
Trichiuris lepturus	10-20	2	3	2.5
	20-30	2	5	3.5
	30-40	1	13	7.0
	40-50	0	1	0.5
	TOTAL	5	22	13.5
Stellifer lanceolatus	< 10	13	8	10.5
	10-20	0	3	1.5
	TOTAL	13	11	12.0
Polydactylus octonemus	< 10	10	2	6.0
Leiostomus xanthurus	< 10	1	0	0.5
	10-20	2	0	1.0
	TOTAL	3	0	1.5
Anchoa mitchilli	< 10	1	1	1.0
Citharichthys spilopterus	< 10	0	2	1.0
Prionotus rubio	< 10	1	0	0.5
Ancylopsetta quadrocellata	10-20	0	1	0.5
Achirus lineatus	< 10	0	1	0.5
NEKTONIC INVERTEBRATES				
Penaeus setiferus	< 10	38	191	114.5
Callinectes similis	< 10	14	155	84.5

Table C6 (continued)

Species	Size Class (cm)	Replicates 1	2	$\bar{X}$
NEKTONIC INVERTEBRATES (con'd)				
Xiphopeneus krøyeri	< 10	1	1	1.0
	10-20	4	6	5.0
	TOTAL	5	7	6.0
Pagurus longicarpus	< 10	0	10	5.0
Callinectes sapidus	< 10	9	0	4.5
Penaeus aztecus	< 10	2	9	5.5
	10-20	3	0	1.5
	TOTAL	5	9	7.0
Acetes americanus carolinae	< 10	3	0	1.5
Loliguncula brevis	< 10	0	2	1.0
Scyphozoa unID	< 10	2	0	1.0
BENTHIC MACROINVERTEBRATES				
Squilla empusa	< 10	0	18	9.0
Lunarca ovalis	< 10	0	5	2.5
Thais haemastoma	< 10	1	0	0.5
Panopeus herbstii	< 10	0	1	0.5
Busycon contrarium	< 10	0	1	0.5
Bunodactis texexsis	< 10	0	1	0.5
Summary				
Vertebrates				
species		9	10	9.5
individuals		199	253	226.0
Nektonic invertebrates				
species		7	5	6.0
individuals		76	364	220.0
Benthic Macroinvertebrates				
species		1	6	3.5
individuals		1	36	18.5

Table C6 (continued)

Species	Size Class (cm)	Replicates 1	2	$\bar{X}$
Summary (con'd)				
Total				
species		17	21	19.0
individuals		276	653	464.5

The station: 27 spp.; 929 ind.

Table C7. Numbers of individuals of the species collected in two replicate 5 minute trawls at pilot study trawl station 6 on 14 May 1975.

Species	Size Class (cm)	Replicates 1	Replicates 2	$\bar{X}$
VERTEBRATES				
Micropogon undulatus	< 10	65	82	73.5
	10-20	4	1	2.5
	TOTAL	69	83	76.0
Symphurus civitatus	< 10	20	21	20.5
	10-20	2	0	1.0
	TOTAL	22	21	21.5
Polydactylus octonemus	< 10	7	10	8.5
Cynoscion arenarius	< 10	1	3	2.0
	10-20	3	5	4.0
	TOTAL	4	8	6.0
Anchoa mitchilli	< 10	5	2	3.5
Stellifer lanceolatus	< 10	0	6	3.0
	10-20	0	1	0.5
	TOTAL	0	7	3.5
Prionotus rubio	< 10	0	1	0.5
Citharichthys spilopterus	< 10	0	1	0.5
Menticirrhus americanus	10-20	0	1	0.5
NEKTONIC INVERTEBRATES				
Callinectes similis	< 10	33	189	111.0
Penaeus setiferus	< 10	57	133	95.0
Penaeus aztecus	< 10	15	6	10.5
	10-20	0	2	1.0
	TOTAL	15	8	11.5
Acetes americanus carolinae	< 10	11	5	8.0
Loliguncula brevis	< 10	2	0	1.0
Sicyonia dorsalis	< 10	2	0	1.0
Xiphopeneus krøyeri	< 10	0	1	0.5

Table C7 (continued)

Species	Size Class (cm)	Replicates 1	Replicates 2	$\bar{X}$
BENTHIC MACROINVERTEBRATES				
Squilla empusa	< 10	15	20	17.5
Gastropoda unID	< 10	0	8	4.0
Busycon contrarium	< 10	0	1	0.5
Persephona aquilonaris	< 10	0	1	0.5
Summary				
Vertebrates				
species		5	9	7.0
individuals		107	134	120.5
Nektonic invertebrates				
species		6	5	5.5
individuals		120	336	228.0
Benthic Macroinvertebrates				
species		1	4	2.5
individuals		15	30	22.5
Total				
species		12	18	15.0
individuals		242	500	371.0

The station: 20 spp.; 742 ind.

Table C8. Numbers of individuals of the species collected in two replicate 5 minute trawls at pilot study trawl station 7 on 12 May 1975.

Species	Size Class (cm)	Replicates 1	Replicates 2	$\bar{X}$
VERTEBRATES				
Micropogon undulatus	< 10	272	52	162.0
	10-20	59	6	32.5
	TOTAL	331	58	194.5
Symphurus civitatus	< 10	12	19	15.5
	10-20	4	0	2.0
	TOTAL	16	19	17.5
Cynoscion arenarius	< 10	2	2	2.0
	10-20	9	4	6.5
	20-30	1	0	0.5
	TOTAL	12	6	9.0
Anchoa mitchilli	< 10	9	3	6.0.
Polydactylus octonemus	< 10	6	3	4.5
Stellifer lanceolatus	< 10	3	1	2.0
	10-20	2	2	2.0
	TOTAL	5	3	4.0
Larimus fasciatus	< 10	1	0	0.5
	10-20	1	1	1.0
	TOTAL	2	1	1.5
Trichuiris lepturus	10-20	1	0	0.5
	20-30	0	1	0.5
	TOTAL	1	1	1.0
Prionotus rubio	< 10	1	0	0.5
NEKTONIC INVERTEBRATES				
Penaeus setiferus	< 10	64	32	48.0
	10-20	0	3	1.5
	TOTAL	64	35	49.5
Callinectes similis	< 10	28	0	14.0
Penaeus aztecus	< 10	2	6	4.0
	10-20	3	1	2.0
	TOTAL	5	7	6.0

Table C8 (continued)

Species	Size Class (cm)	Replicates 1	Replicates 2	$\bar{X}$
NEKTONIC INVERTEBRATES (con'd)				
Loliguncula brevis	< 10	3	4	3.5
	10-20	0	1	0.5
	TOTAL	3	5	4.0
Xiphopeneus krøyeri	< 10	1	0	0.5
	10-20	3	0	1.5
	TOTAL	4	0	2.0
Acetes americanus carolinae	< 10	1	0	0.5
BENTHIC MACROINVERTEBRATES				
Squilla empusa	< 10	2	3	2.5
Summary				
Vertebrates				
species		9	8	8.5
individuals		383	94	238.5
Nektonic Invertebrates				
species		6	3	4.5
individuals		105	47	76.0
Benthic Macroinvertebrates				
species		1	1	1.0
individuals		2	3	2.5
Total				
species		16	12	14.0
individuals		490	144	317.0

The station: 16 spp.; 634 ind.

Table C9. Numbers of individuals of the species collected in two replicate 5 minute trawls at pilot study trawl station 8 on 12 May 1975.

Species	Size Class (cm)	Replicates 1	2	$\bar{X}$
VERTEBRATES				
Micropogon undulatus	< 10	691	56	373.5
	10-20	38	3	20.5
	TOTAL	729	59	394.0
Symphurus civitatus	< 10	13	77	45.0
	10-20	0	3	1.5
	TOTAL	13	80	46.5
Stellifer lanceolatus	< 10	4	11	7.5
	10-20	1	0	0.5
	TOTAL	5	11	8.0
Cynoscion arenarius	< 10	1	0	0.5
	10-20	3	1	2.0
	TOTAL	4	1	2.5
Trichiuris lepturus	10-20	2	0	1.0
	20-30	1	0	0.5
	30-40	1	0	0.5
	TOTAL	4	0	2.0
Larimus fasciatus	< 10	2	0	1.0
Anchoa mitchilli	< 10	1	0	0.5
Leiostomus xanthurus	10-20	1	0	0.5
Menticirrhus americanus	10-20	1	0	0.5
Prionotus rubio	< 10	0	1	0.5
Achirus lineatus	< 10	0	1	0.5
NEKTONIC INVERTEBRATES				
Callinectes similis	< 10	1	103	52.0
Penaeus setiferus	< 10	8	58	33.0
	10-20	0	3	1.5
	TOTAL	8	61	34.5
Penaeus aztecus	< 10	5	10	7.5
	10-20	0	2	1.0
	TOTAL	5	12	8.5

Table C9 (continued)

Species	Size Class (cm)	Replicates 1	Replicates 2	$\bar{X}$
NEKTONIC INVERTEBRATES (con'd)				
Xiphopeneus krøyeri	< 10	2	8	5.0
	10-20	1	4	2.5
	TOTAL	3	12	7.5
Callinectes sapidus	< 10	2	0	1.0
Scyphozoa unID	< 10	1	0	0.5
BENTHIC MACROINVERTEBRATES				
Squilla empusa	< 10	1	6	3.5
Busycon contrarium	< 10	1	0	0.5
Summary				
Vertebrates				
species		9	6	7.5
individuals		760	153	456.5
Nektonic Invertebrates				
species		6	4	5.0
individuals		20	188	104.0
Benthic Macroinvertebrates				
species		2	1	1.5
individuals		2	6	4.0
Total				
species		17	11	14.0
individuals		782	347	564.5

The station: 19 spp.; 1127 ind.

Table C10. Numbers of individuals of the species collected in two replicate 5 minute trawls at pilot study traw station 9 on 14 May 1975.

Species	Size Class (cm)	Replicates 1	Replicates 2	$\bar{X}$
VERTEBRATES				
Micropogon undulatus	< 10	65	123	94.0
	10-20	0	1	0.5
	TOTAL	65	124	94.5
Symphurus civitatus	< 10	49	78	63.5
	10-20	30	10	20.0
	TOTAL	79	88	83.5
Polydactylus octonemus	< 10	14	8	11.0
	10-20	1	0	0.5
	TOTAL	15	8	11.5
Cynoscion arenarius	< 10	3	2	2.5
	10-20	6	4	5.0
	TOTAL	9	6	7.5
Stellifer lanceolatus	< 10	5	3	4.0
	10-20	1	0	0.5
	TOTAL	6	3	4.5
Anchoa mitchilli	< 10	2	5	3.5
Prionotus rubio	< 10	0	3	1.5
Larimus fasciatus	< 10	2	0	1.0
Trichiuris lepturus	< 10	1	0	0.5
Umbrina coroides	10-20	1	0	0.5
NEKTONIC INVERTEBRATES				
Callinectes similis	< 10	170	96	133
Penaeus setiferus	< 10	100	56	78.0
	10-20	1	1	1.0
	TOTAL	101	57	79.0
Penaeus aztecus	< 10	21	12	16.5
	10-20	4	3	3.5
	TOTAL	25	15	20.0
Acetes americanus carolinae	< 10	5	25	15.0

Table C10 (continued)

Species	Size Class (cm)	Replicates 1	Replicates 2	$\bar{X}$
NEKTONIC INVERTEBRATES (con'd)				
Lolliguncula brevis	< 10	2	0	1.0
Callinectes sapidus	15-20	0	2	1.0
BENTHIC MACROINVERTEBRATES				
Squilla empusa	< 10	26	13	19.5
	10-20	1	0	0.5
	TOTAL	27	13	20.0
Busycon contrarium	< 10	1	0	0.5
Pagurus longicarpus	< 10	0	1	0.5
Summary				
Vertebrates				
species		9	7	8.0
individuals		180	237	208.5
Nektonic Invertebrates				
species		5	5	5.0
individuals		303	195	249.0
Benthic Macroinvertebrates				
species		2	2	2.0
individuals		28	14	21.0
Total				
species		16	14	15.0
individuals		511	446	478.5

The station: 19 spp.; 957 ind.

APPENDIX D

RAW ZOOPLANKTON DATA FROM THE PILOT STUDY

Table D1. Meroplankton data from the pilot study collections in the dredged material disposal area on 14 May 1975. Data are the numbers of individuals of each taxon per m^3 of water filtered in each replicate tow. A - collection from inshore half of DMDS; B - collection from offshore half of DMDS.

	A_1	A_2	B_1	B_2
CNIDARIA				
Hydromedusa #11	0.4	4.5	1.4	3.0
Phialidium hemisphaericum	3.1	7.9	16.6	7.2
Liriope tetraphylla	0.2	0.2	0.2	
Hydromedusa #9		1.6	0.4	2.0
Bougainvillia sp.	1.9	3.7	1.6	5.2
Hydromedusa unID	3.1	14.0	4.2	14.6
Ephyra		4.2		
Hydromedusa #12		0.5	1.0	
Hydromedusa #13				
Phialidium cf. *bicophorum*				
Bougainvillia (or *Nmemopsis*)				
Aglaura cf. *hemistoma*				
Anthozoa larva				
Hybacodon sp.?				
Hydromedusa #15				
Hydroid polyp				
Hydromedusa #17				
ANNELIDA				
Polychaeta				
Spionidae larva	0.3		0.2	
Prionospio pinnata P.L.		0.5		
Terebellidae P.L.		0.2	1.0	
Neveis or *Autolytus* P.L.			0.4	
Polychaeta #15 P.L.	0.1			2.0
Polychaeta #3 P.L.				2.0
Autolytus prolifer				0.8
Polychaeta larva				
Polychaete L #6				
Magellona P.L.				
Polychaete #12 P.L.				
Nereis sp. larva				
Polychaeta #13 P.L.				
Polychaeta #3 L.				
Owenia larva				
Polychaeta #17 P.L.				
Polychaeta #18 P.L.				
Polydora sp. P.L.				
Spionidae #15 P.L.				
Polychaeta #5 P.L.				
PHORONIDA				
Actinotroch larva	1.6	8.4	5.2	6.2

Table D1. (continued)

	A_1	A_2	B_1	B_2
ECTOPROCTA				
Cyphonautes larva		1.4		
Cyphonautes L #2				
MOLLUSCA				
Trochophore larva				
Gastropod larva	3.9	39.2	36.0	18.8
Bivalve larva	0.8	40.6	42.8	12.4
Veliger	0.2	1.4	0.2	
ARTHROPODA - CRUSTACEA				
Copepoda				
Caligoida				
Caligus (chelifer)		0.2		
Caligus sp.				
Cirripedia				
nauplii	7.8		6.8	10.4
Cypris larva	4.7	1.4	0.4	2.0
Stomatopoda				
Pseudozoea larva				
Mysidacea				
Promysis atlantica	50.6	84.0	11.6	39.4
Bowmaniella braziliense				
Braziliomysis castroi				
Promysis americana				
Mysidopsis bigelowi				
Cumacea				
Oxyurostylis salinoi				0.4
unknown				
Amphipoda				
Gammaridea				
Gammarid #1				0.8
Gammarid #2			0.2	0.8
Corphium sp.				
Cerapus tubularis				
Gammaridea #3				
Gammaridea #5				
Caprellidea				
Caprellidae unID				
Isopoda				
Isopoda #A=2-DS				
Isopoda #A-1-DS				
Isopoda (*Munna* sp.)				
Isopod				
Decapoda				
Pinnixa sp. zoea	16.4	25.2	34.2	9.6
Pinnixa chaetoperana zoea	0.1	0.2	0.4	2.0
Upogebia affinis zoea	0.3		4.2	2.4
Callianassa sp. 2 zoea	0.3	0.3	1.8	

Table D1. (continued)

	A_1	A_2	B_1	B_2
ARTHROPODA - CRUSTACEA (con'd)				
Clibanarius vittatus zoea	1.6	2.0	0.4	0.8
Paguridae zoea	0.5	2.2		
Porcellanidae zoea	1.3	11.4	2.6	3.6
Paguridae glaucothoe	0.2			
Hexapanopeus sp. megalops	0.2			
Ovalipes ocellata zoea #5	4.7			
Ogyrides limicola zoea	5.5	1.6	6.2	5.0
Anomura #2 zoea				
Pinnotheres zoea		0.2		
Callianassa sp. 1 zoea		0.5		
Alpheidae zoea		0.6	0.4	
Portunidae zoea		0.2	1.8	0.2
Xanthidae zoea		2.6	5.4	2.2
Sesarma sp. megalops		0.2		
Anomura #12 zoea	0.7	0.5	1.0	
Palaemonetes sp. zoea		0.2	0.2	0.8
Hippolyte sp. zoea			0.2	0.4
Penaeidae protozoea			6.8	
Uca zoea			0.4	
Trachypeneus sp. protozoea				
Callinectes sp. zoea				
Upogebia sp. 2 zoea			1.8	
Penaeus sp. mysis				
Callinectes sp. megalops				
Pinnotheres sp. megalops				
Lepidopa cf. *benedicti* zoea				
Sesarma sp. zoea				
Decapoda metanauplius				
Callianassa sp. 3 zoea				
Neopanope sp. zoea				
Decapoda megalops				
Brachyura #7 zoea				
Hippolysmata wurdemanni zoea				
Euceramus praelongus zoea				
Decapoda sp. protozoea				
Caridea # 3 zoea				
Panopeus herbstii zoea				
Pinnixa sayana zoea				
Pagurus pollicaris zoea				
Xiphopeneus mysis				
Trachypeneus mysis				
Menippe mercenaria megalops				
Pinnixa sp. megalops				
Hexapanopeus angustifrons zoea				
Alpheis heterochaelis zoea				
Alpheis normani zoea				
Pagurus longicarpus zoea				

Table D1. (continued)

	A_1	A_2	B_1	B_2
ARTHROPODA - CRUSTACEA (con'd)				
Porcellana sp. zoea				
Paguridae #7 zoea				
Euceramus praelongus megalops				
Penaeus setiferus P.L.				
Penaeus aztecus P.L.				
Trachypeneus P.L.				
ECHINODERMATA				
Bipinnaria larva	0.3			
Auricularia larva		4.2		
Ophiopluteus larva		1.4		

Table D2. Holoplankton data from the pilot study collections in the dredged material disposal site on 14 May 1975. Data are the numbers of individuals of each taxon per m^3 of water filtered during each replicate tow. A - collections from the inshore half of the DMDS; B - collections from the offshore half of the DMDS.

	A_1	A_2	B_1	B_2
PROTOZOA				
Tintinnid #2				
Tintinnid #4				
Elphidium sp.				
Miliammina sp.				
Trachammina sp.				
Foraminifera unID				
CNIDARIA				
Nectophore	2.3	21.0	12.4	25.0
Siphonophora			0.2	
Muggiaea kochi				
Eudoxides spiralis				
Siphonophore fragment				
CTENOPHORA				
Beroe ovata	1.6	5.8	1.6	5.6
Mnemiopsis mcCradyi			0.2	0.2
Larva				
ANNELIDA				
Polychaeta				
Sagitella kowalevskii	0.3	2.3	0.6	1.4
Tomopterus P.L.				
MOLLUSCA				
Creseis acicula				0.4
ARTHOPODA - CRUSTACEA				
Cladocera				
Penilia avirostris				
Evadne sp.				
Ostracoda				
Euconchoecia sp.				
Copepoda				
Copepod nauplii		8.4	9.4	12.4
Argulus sp.	0.1			
Calanoids				
Acartia tonsa	654.5	875.5	2201.2	1513.2
Acartia copepodids	2306.5	542.8	1933.8	1006.0
A. lilljeborgii				
Paracalanus crassirotris	15.6	101.6	36.0	35.4
P. (parvus grp) adults	716.9	724.9	898.2	769.0

Table D2. (continued)

	A_1	A_2	B_1	B_2
ARTHOPODA - CRUSTACEA (con'd)				
P. (parvus grp) copepodids		875.5	562.2	686.0
P. copepodids				
Nannocalanus minor			0.2	
Labidocera aestiva	24.9	19.6	49.8	45.8
Labidocera copepodids		4.2	380.6	232.8
Centropages velificatus	4.7	4.0	8.6	3.4
Temora turbinata	0.8	0.8	0.8	2.0
T. stylifera	0.1	0.3	0.4	0.4
Eucalanus pileatus	10.1		28.4	33.0
Euchaeta paraconcinna	0.8	2.8	0.8	1.2
Undinula vulgaris	0.3		0.4	
Rhincalanus sp.	0.1			
Temora sp. copepodids		4.2	3.4	2.0
Undinula vulgaris		0.3		
Centropages velificatus copepodids		1.4	0.8	4.2
Eurytemora hirundoides			0.2	
Paracalanus aculeatus			1.2	16.6
Euchata copepodids				0.4
Eucalanus (pileatus)		8.9	11.2	15.0
Calanopia americana				
Pontellopsis villosa				
Pontella cf. meadii				
Pseudodiaptomus coronatus				
Calanoid unID				
Harpacticoida				
Euterpina acutifrons		1.4		0.4
Macrosetella gracilis	0.3		0.2	
Microsetella narvegica				
Longipedia coronata				
Cytemnestra rostrata		1.4		
Ectinosomidae sp.				
Cyclopoids				
copepodites	7.8			
Oithona nana				
Oithona colcarva	7.8	5.6		
Oithona plumifera				
Oithona sp.				
Corycaeus giesbrechti				
Corycaeus copepodites				
Corycaeus americanus	46.8	80.5	24.0	10.4
Corycaeus amazonicus	7.8	26.6	4.1	10.4
Oncaea venusta		0.3	0.4	
Ergasilus sp.		0.2		
Oncaea sp.				
Sapphirina nigromaculata				
Sabelliphilidae sp.				

Table D2. (continued)

	A_1	A_2	B_1	B_2
ARTHROPODA - CRUSTACEA (con'd)				
Amphipoda				
Hyperiidea				
Hyperiid sp. 1	0.8	0.3		0.4
Parathemisto sp.				
Hyperidea sp. #2				
Hyperiella sp.				
Decapoda				
Acetes larva	8.6	33.6		20.0
Lucifer larva				0.4
Lucifer faxoni	1.2	4.4	2.4	0.4
Acetes americanus	7.8		21.2	1.8
CHAETOGNATHA				
Sagitta sp.	469.1	504.3		320.0
Sagitta enflata	0.8	3.0	1.0	2.4
Sagitta tenuis			318.8	
Sagitta hispida				
CHORDATA				
Urochordata				
Oikopleura spp.	46.8	77.0	34.2	14.6
Doliolum sp.				
Salpa sp.				

APPENDIX E

RAW BENTHIC DATA FROM THE EXPERIMENTAL STUDY

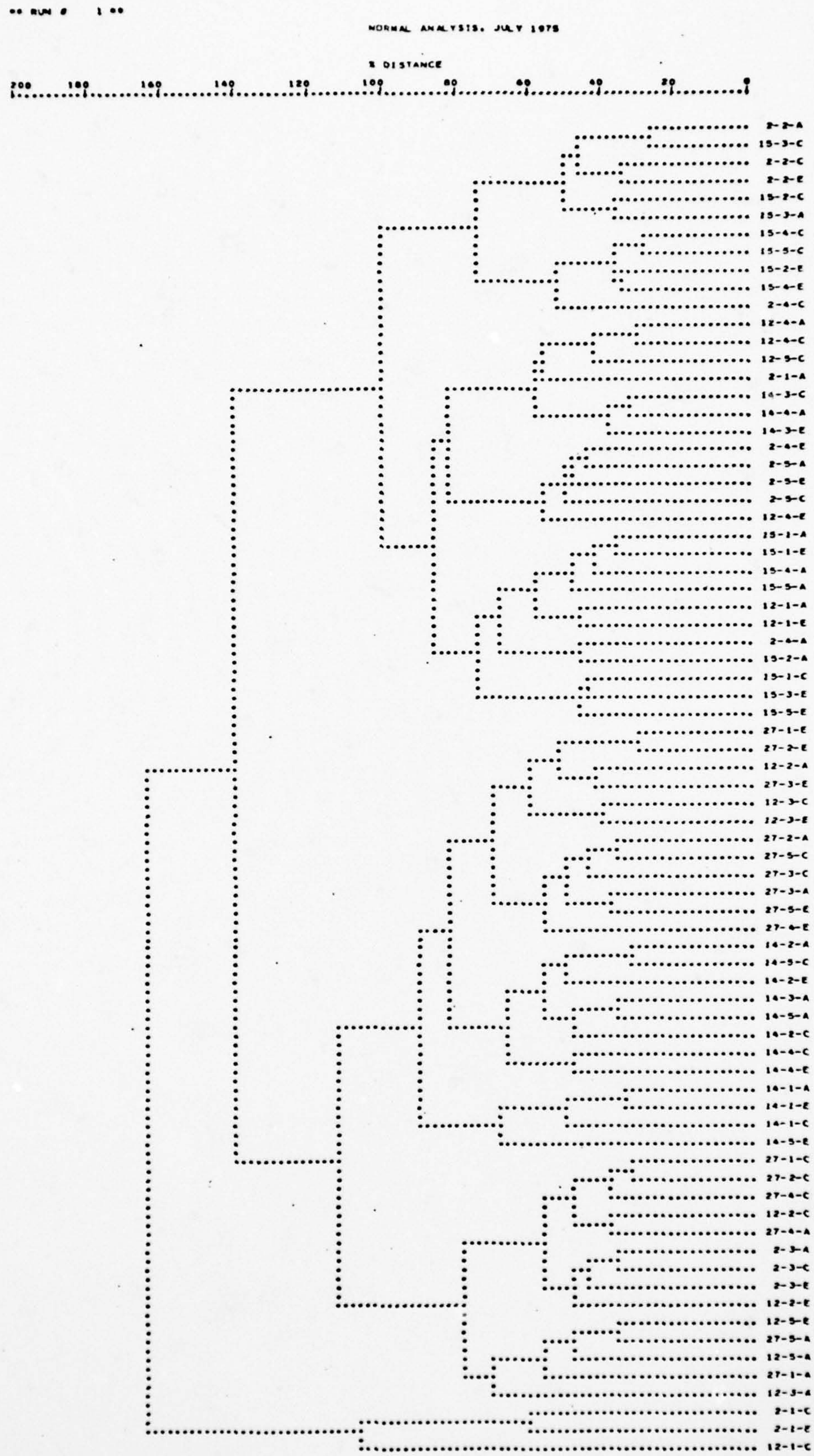


Figure E1. Site group dendrogram, July benthic data--individual replicates

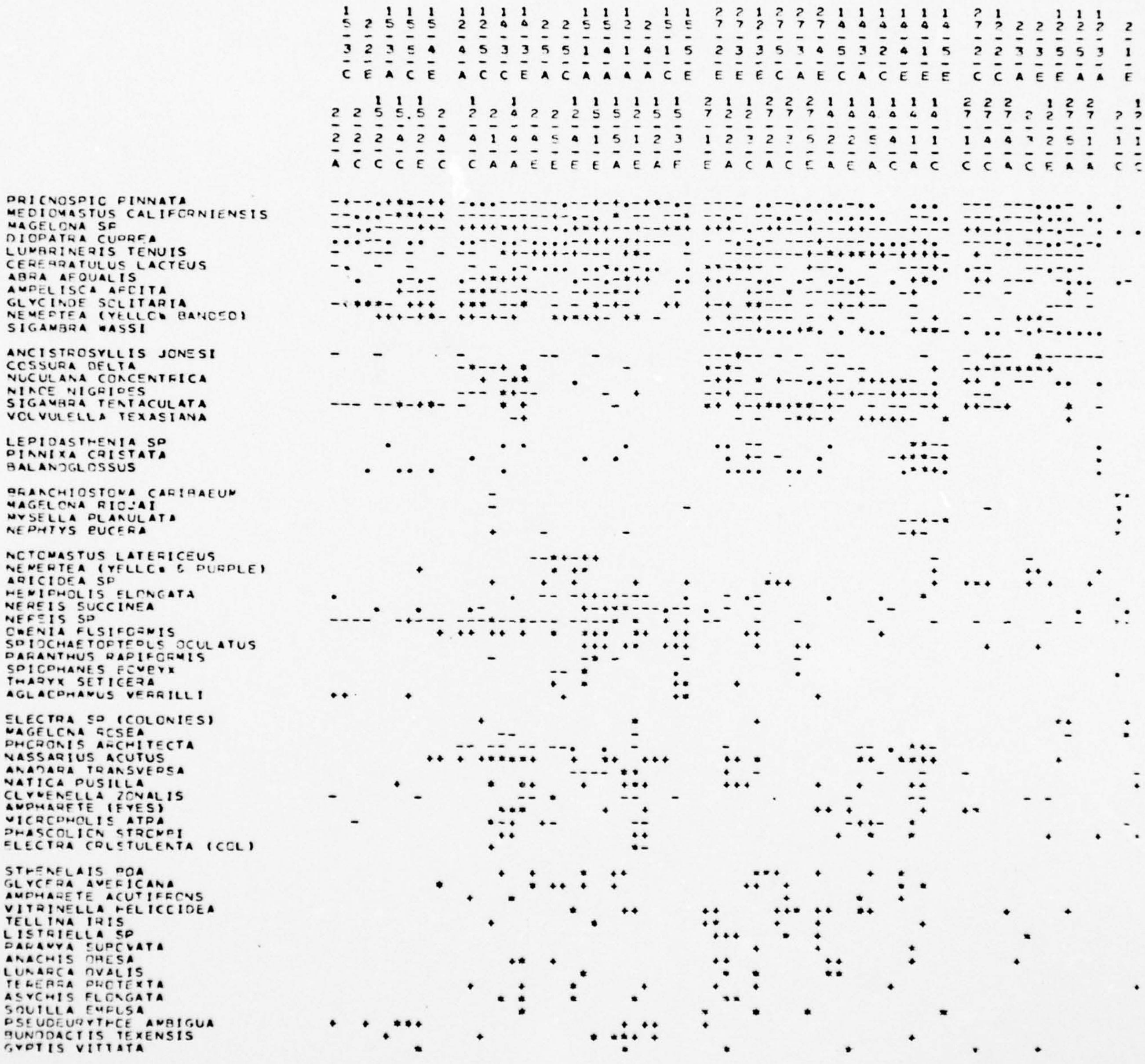


Figure E2. Two-way table, July benthic data--individual replicates

** RUN # 1 **

NORMAL ANALYSIS, SEPT 1975

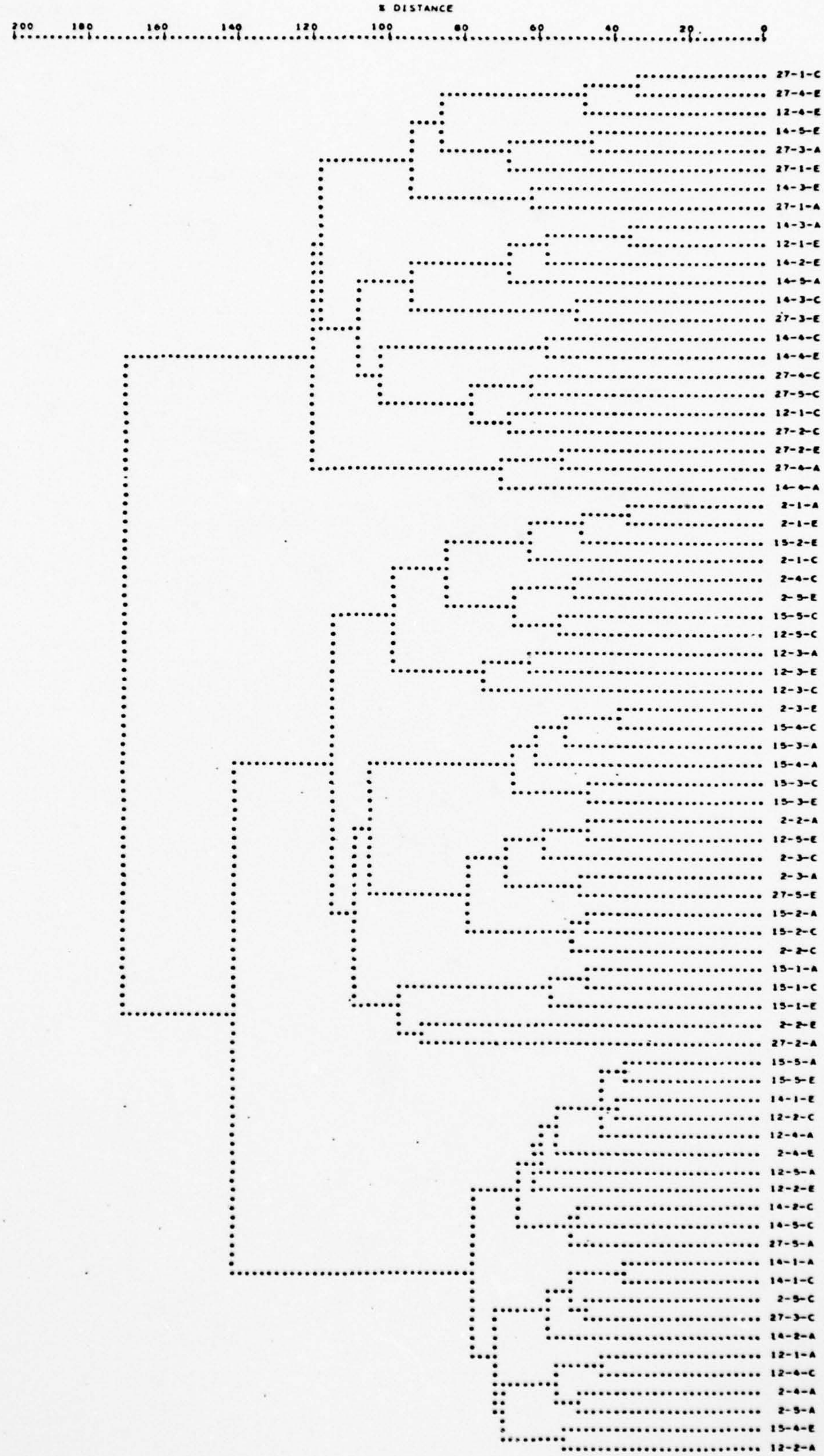


Figure E3. Site group dendrogram, September benthic data--individual replicates

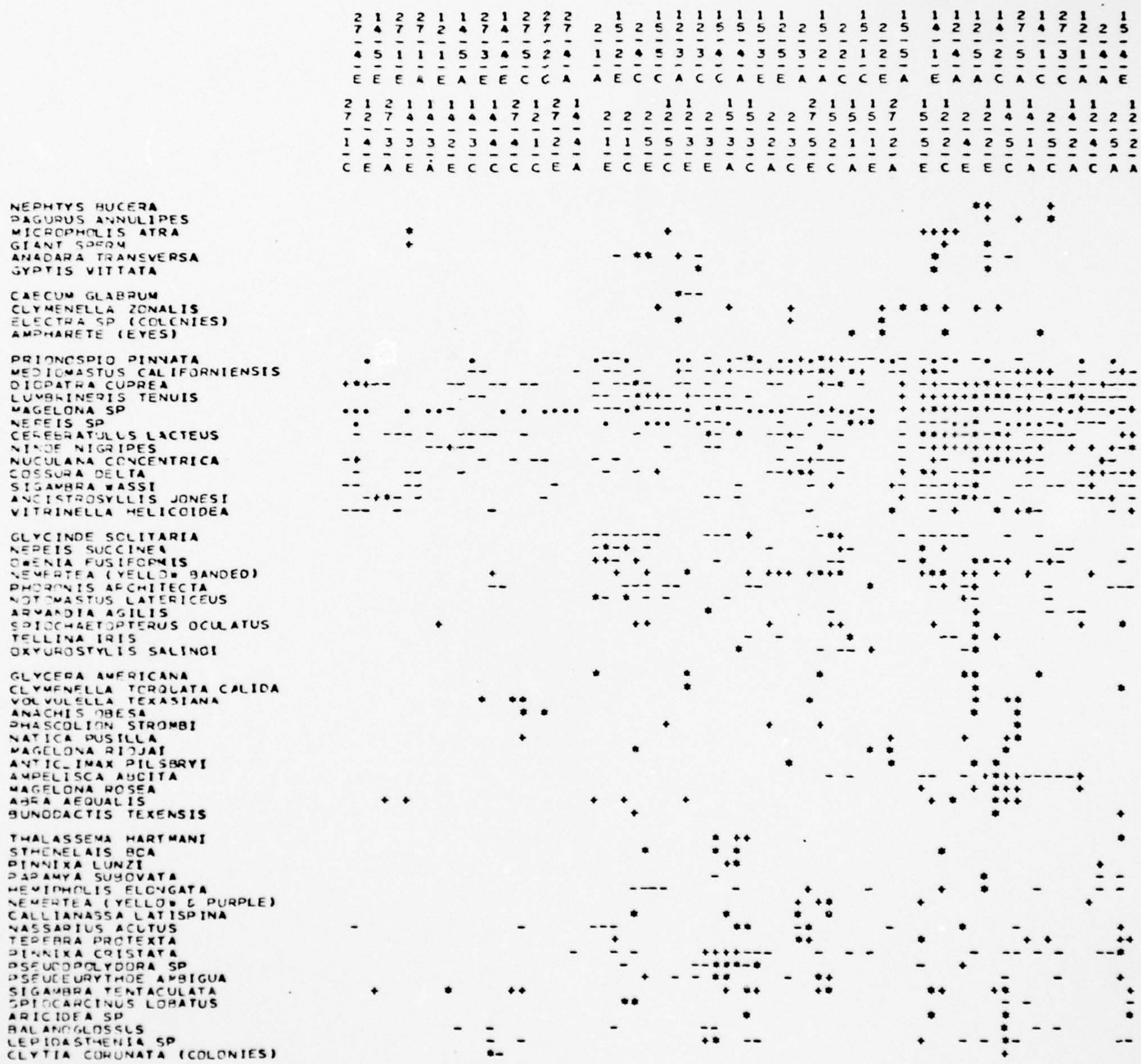


Figure E4. Two-way table, September benthic data--individual replicates

AD-A061 844 ARMY ENGINEER WATERWAYS EXPERIMENT STATION VICKSBURG MISS F/G 13/3
AQUATIC DISPOSAL FIELD INVESTIGATIONS GALVESTON, TEXAS, OFFSHOR--ETC(U)
MAY 78 T D WRIGHT, D B MATHIS, J M BRANNON

UNCLASSIFIED WES-TR-D-77-20 NL

6 OF 10
ADA
061844

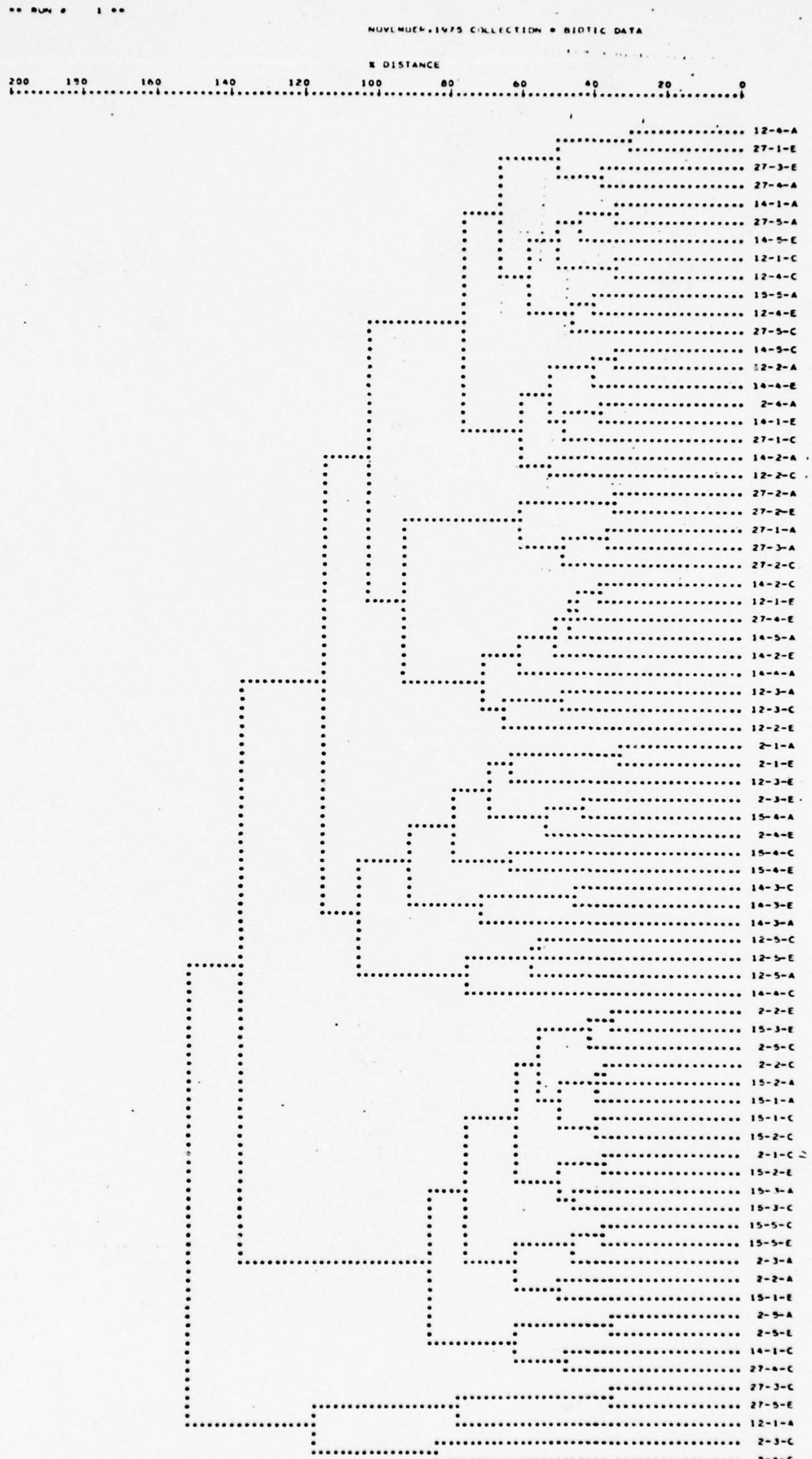


Figure E5. Site group dendrogram, November benthic data--individual replicates

Figure E6. Two-way table, November benthic data--individual replicates

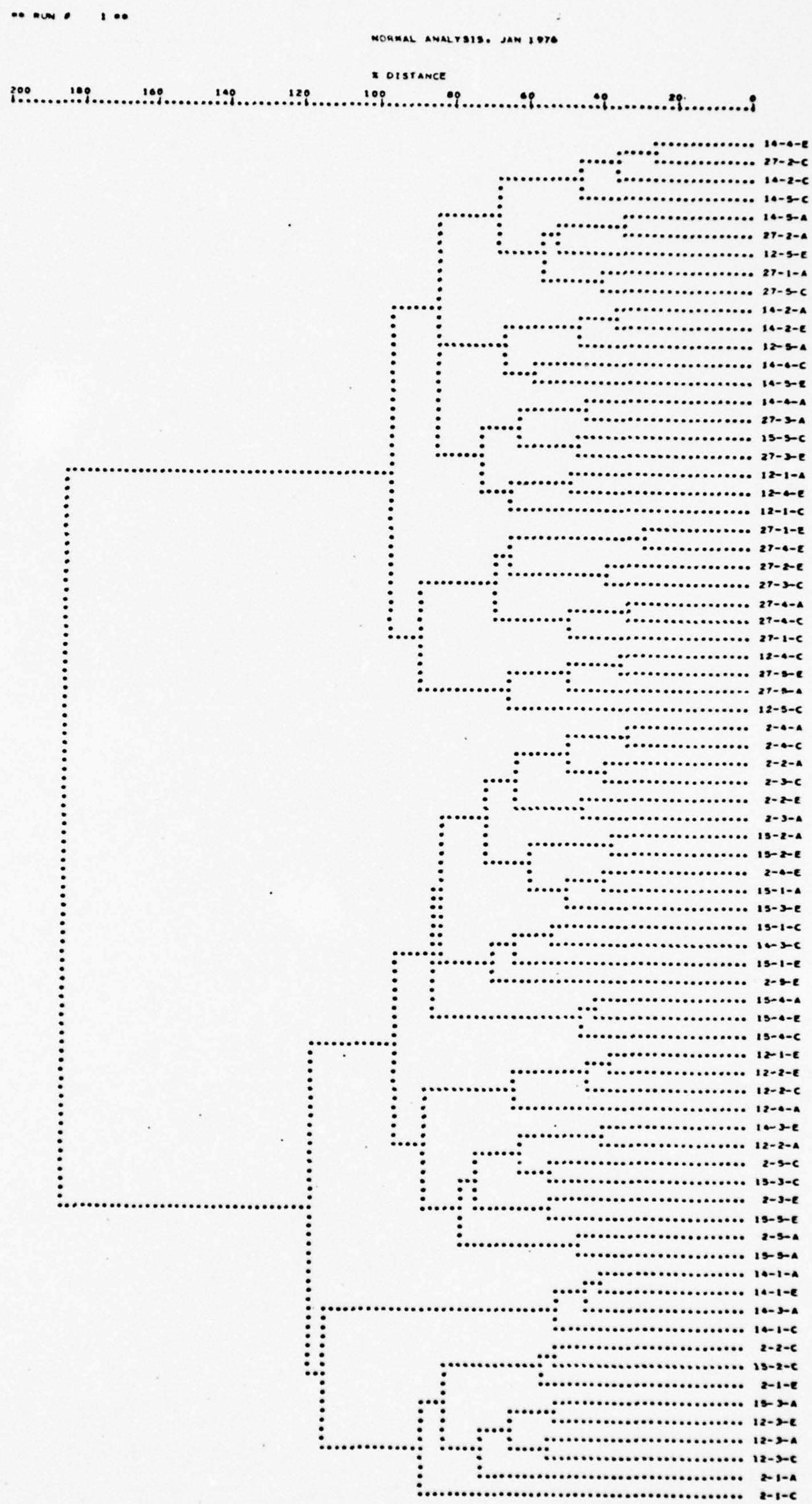


Figure E7. Site group dendrogram, January benthic data--individual replicates

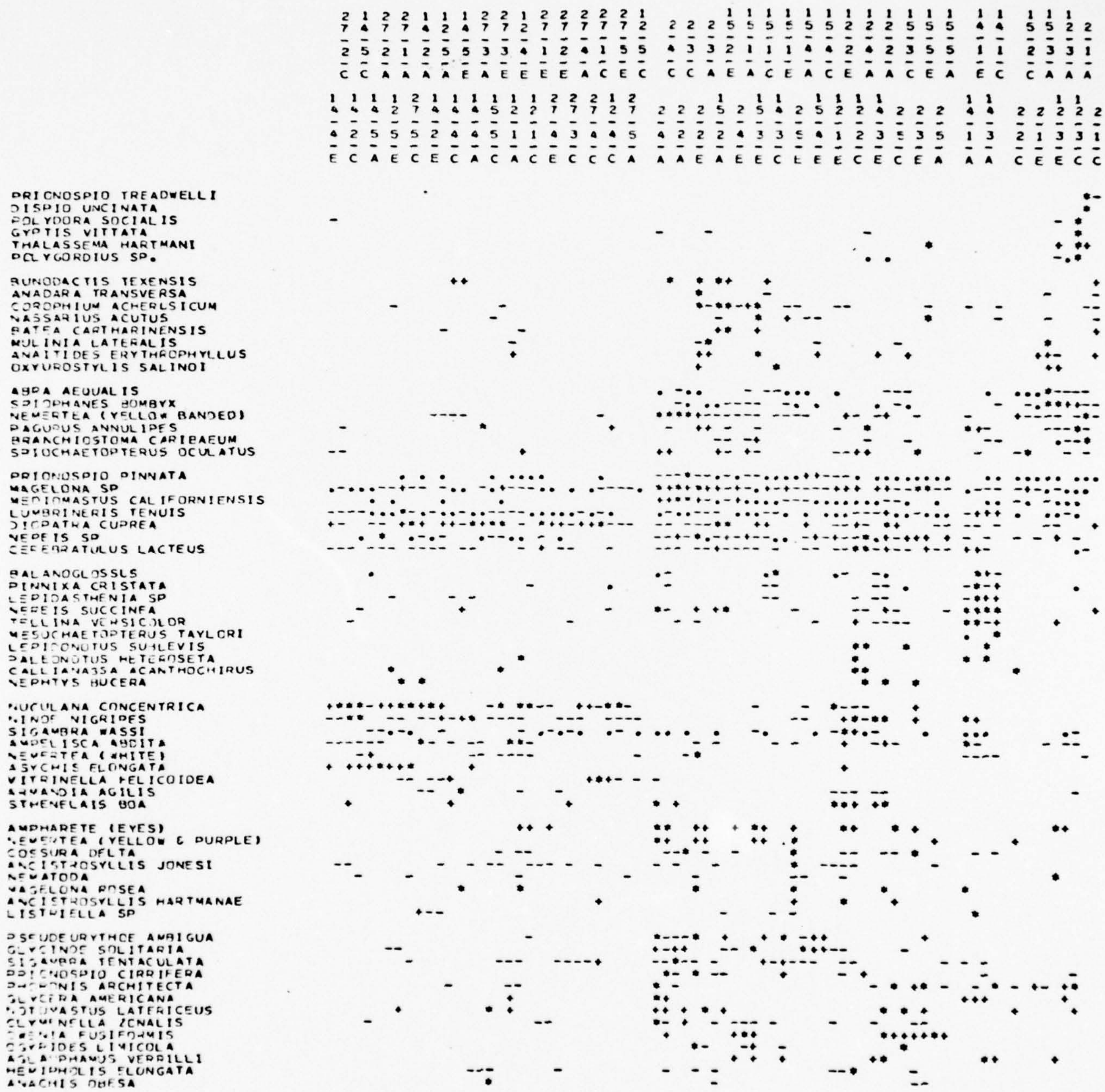


Figure E8. Two-way table, January benthic data--individual replicates

** RUN # 1 **

NORMAL ANALYSIS, MAR 1976

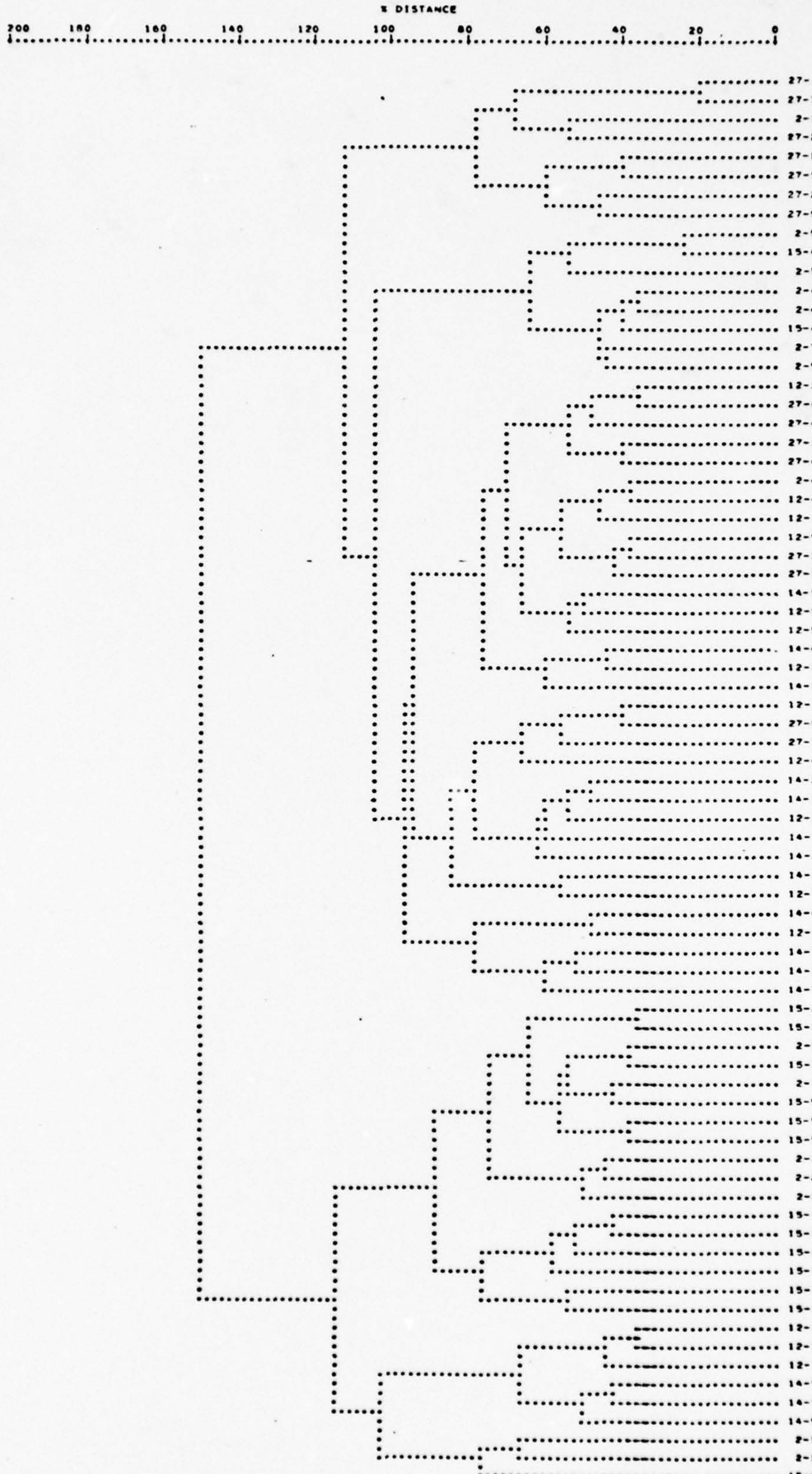


Figure E9. Site group dendrogram, March benthic data--individual replicates

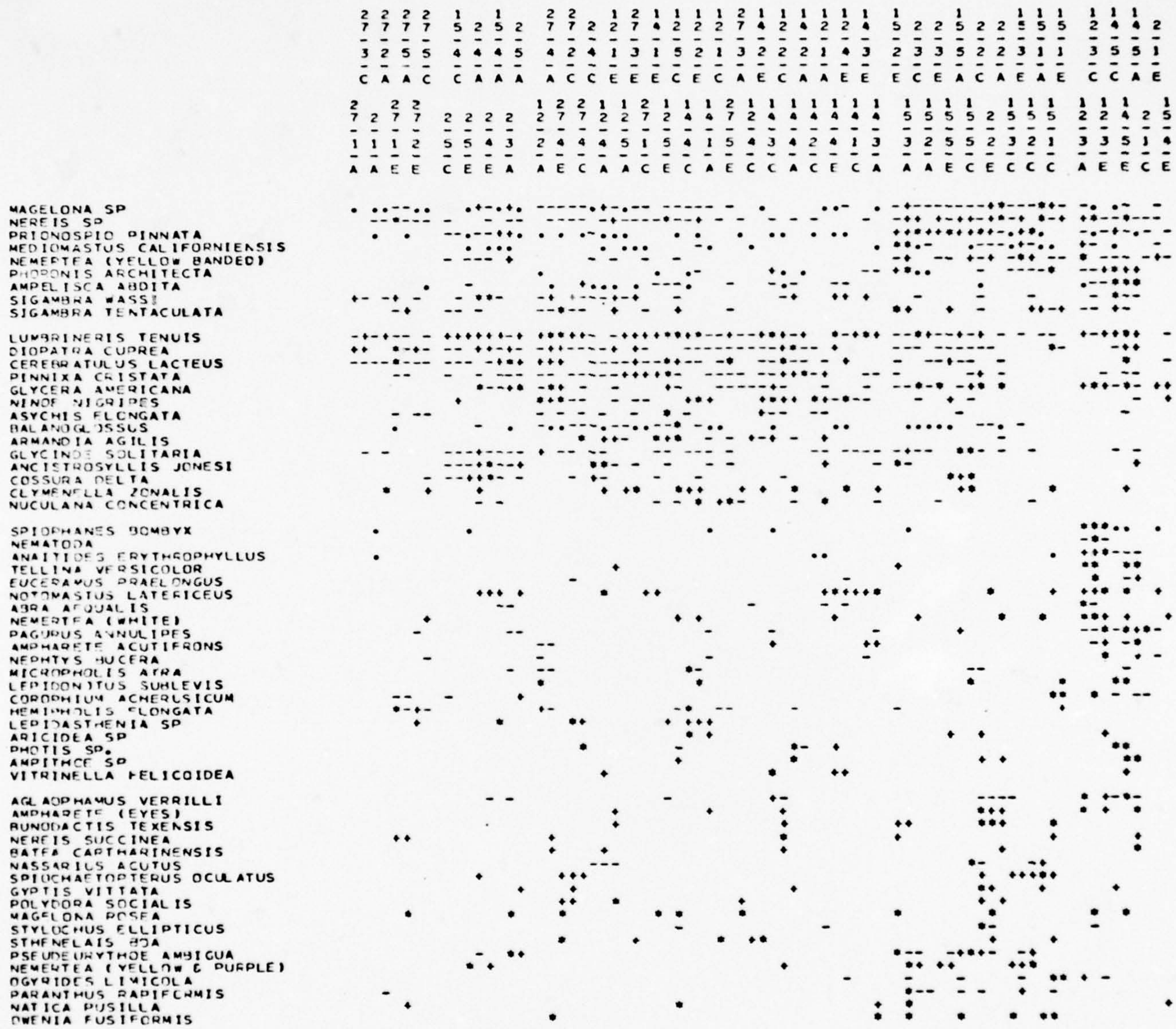


Figure E10. Two-way table, March benthic data--individual replicates

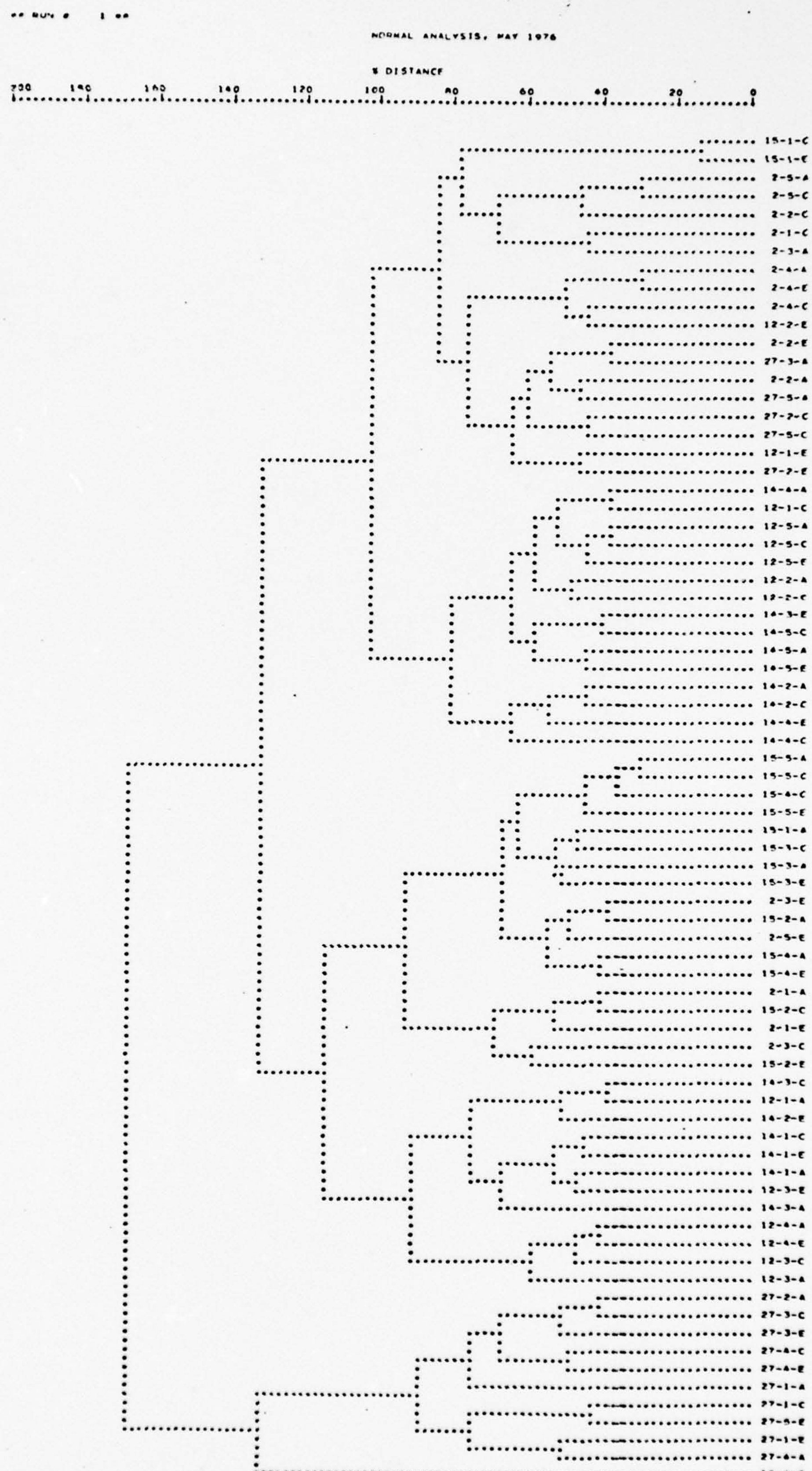


Figure E11. Site group dendrogram, May benthic data--individual replicates

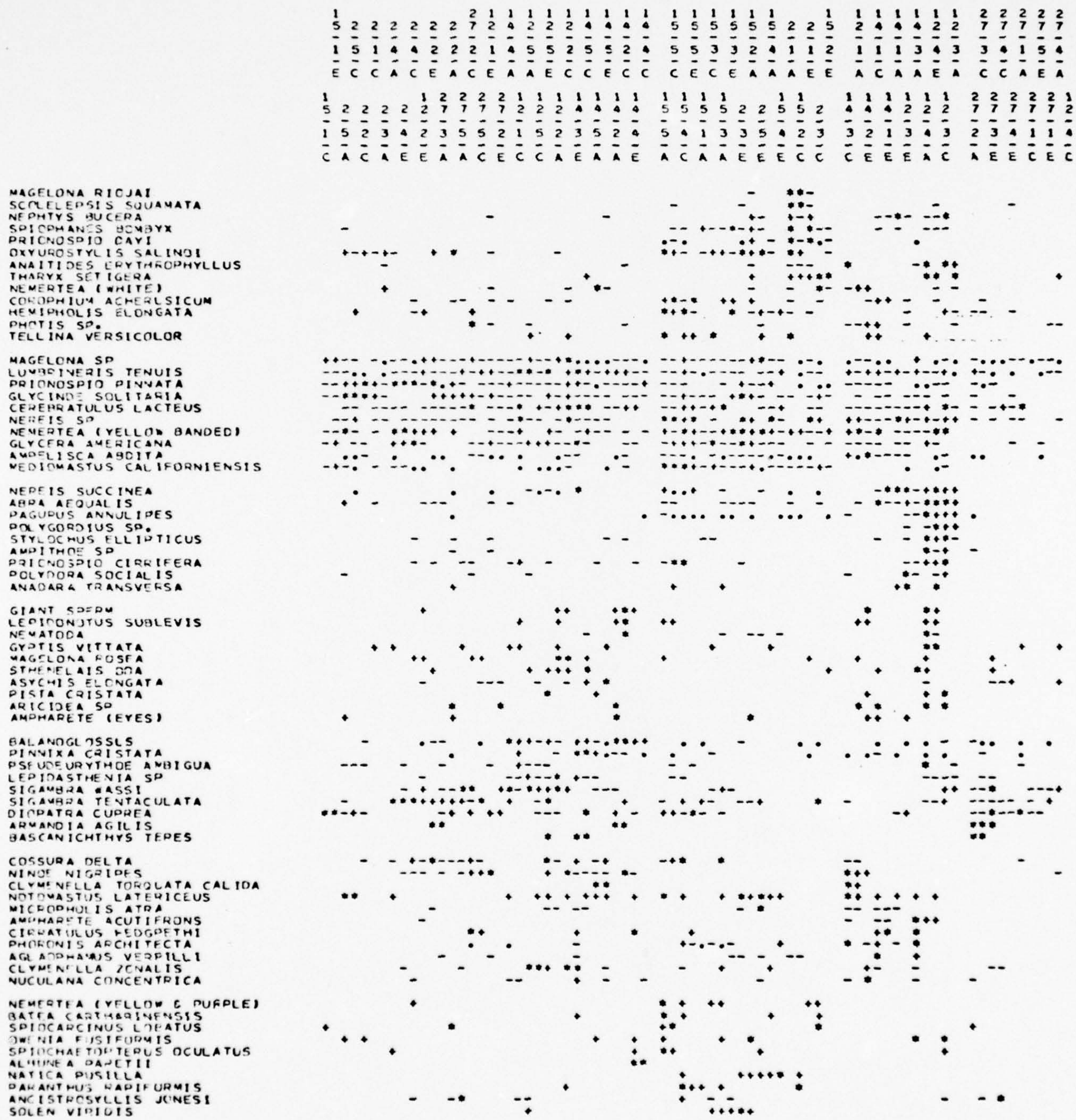


Figure E12. Two-way table, May benthic data--individual replicates

Table E1. Taxonomic list of all macrobenthic species collected during the experimental study, July 1975 - May 1976, in the dredged material site, Galveston, Texas.

CNIDARIA
- Hydrozoa
  - *Lovenella gracilis*
  - *Obelia bicuspidata*
- Anthozoa
  - Anemone A
  - Anemone unID
  - Anemone (sand encrusted)
  - *Bunodactis texensis*
  - *Edwardsia* sp.
  - *Paranthus rapiformis*

PLATYHELMINTHES
- Turbellaria
  - *Stylochus ellipticus*
  - Turbellaria, Black Spots

NEMERTEA
- *Cerebratulus lacteus*
- *Cerebratulus luridus*
- Nemertea (Brown Band)
- Nemertea (White)
- Nemertea (Yellow and Brown)
- Nemertea (Yellow and Purple)
- Nemertea (Yellow Banded)

NEMATODA
- Nematoda

BRYOZOA
- *Electra crustulenta*
- *Electra* sp. (colonies)

PHORONIDA
- *Phoronis architecta*

MOLLUSCA
- Gastropoda
  - *Acteon punctostriatus*
  - *Anachis obesa*
  - *Anticlimax pilsbryi*
  - *Busycon contrarium*
  - *Caecum glabrum*
  - *Cantharus cancellarius*
  - *Crepidula fornicata*
  - *Crepidula plana*

MOLLUSCA (continued)
  - *Credpidula* sp.
  - *Cyclostremiscus suppressus*
  - *Epitonium angulatum*
  - *Epitonium multistriatum*
  - *Nassarius acutus*
  - *Natica pusilla*
  - *Odostomia gibbosa*
  - *Polinices duplicatus*
  - *Sinum maculatum*
  - *Strombiformis bilineata*
  - *Teinostomia biscayense*
  - *Terebra protexta*
  - *Turbonilla interrupta*
  - *Varicorbula operculata*
  - *Vitrinella helicoidea*
  - *Volvulella texasiana*
- Bivalvia
  - *Abra aequalis*
  - *Agripoma texasiana*
  - *Anadara brasiliana*
  - *Anadara transversa*
  - *Anatina anatina*
  - Bivalve unID
  - *Chione* sp.
  - *Corbula barrattania*
  - *Corbula dietziana*
  - *Corbula swiftiana*
  - *Crassinella lunulata*
  - *Diplodonta* sp.
  - *Dosinia discus*
  - *Lucina amiantis*
  - *Lunarca ovalis*
  - *Macoma constricta*
  - *Macoma tenta*
  - *Mercenaria mercenaria*
  - *Mulinia lateralis*
  - *Mysella planulata*
  - Mytilidae
  - *Nuculana acuta*
  - *Nuculana concentrica*
  - *Pandora trilineata*
  - *Paramya subovata*
  - *Petricola pholadiformis*
  - *Solen viridis*
  - *Tellina alternata*

Table E1 (continued)

MOLLUSCA (continued)

Tellina iris
Tellina lineata
Tellina versicolor
Tellinidae

Scaphopoda

Dentalium texasianum

ANNELIDA

Class Polychatea

Aglaophamus verrilli
Amathia sp.
Ampharete acutifrons
Ampharete (Eyes)
Anaitides erythrophyllus
Ancistrosyllis hartmanae
Ancistrosyllis jonesi
Arabella sp.
Aricidea sp.
Armandia agilis
Asychis elongata
Boccardia hamata
Boccardia sp.
Ceratocephale sp.
Chaetopterus variopedatus
Cirratulus hedgpethi
Clymenella sp.
Clymenella torquata calida
Clymenella zonalis
Cossura delta
Diopatra cuprea
Dispio uncinata
Drilonereis longa
Drilonereis magna
Eteone heteropoda
Eumida sanguinea
Euniceacea
Eunoe sp.
Flabelligeridae sp.
Glycera americana
Glycinde solitaria
Grubeulepis sp.
Gyptis vittata
Laonome sp.
Lepidasthenia sp.
Lepidonotus sublevis
Loimia viridis
Lumbrineris tenuis

ANNELIDA (continued)

Magelona (serrate prostom)
Magelona riojai
Magelona rosea
Magelona sp.
Malacoceros sp.
Maldane sarsi
Marphysa sanguinea
Mediomastus californiensis
Megalomma bioculatum
Melinna maculata
Mesochaetopterus taylori
Myriowenia californiensis
Naineris laevigata
Nephtys incisa
Nephtys magellanica
Nephtys picta
Nereis sp.
Nereis succinea
Ninoe nigripes
Notomastus hemipodus
Notomastus latericeus
Owenia fusiformis
Paleonotus heteroseta
Parahesione luteola
Pectinaria gouldii
Pilargis pacifica
Pista cristata
Pista palmata
Poecilochaetus johnsoni
Polydora commensalis
Polydora socialis
Polynoidae
Polyodontes lupina
Prionospio cirrifera
Prionospio cirrobranchia
Prionospio dayi
Prionospio heterobranchia
Prionospio pinnata
Prionospio treadwelli
Pseudeurythoe ambigua
Pseudopolydora sp.
Schistomeringos rudolphi
Scolepsis squamata
Scoloplos foliosus
Scoloplos sp.
Scoloplos rubra
Sigambra tentaculata

Table E1 (continued)

ANNELIDA (continued)
Sigambra wassi
Spiochaetopterus oculatus
Spionidae
Spiophanes bombyx
Spio pettiboneae
Sthenelais boa
Streblospio benedicti
Terebellidae sp. A
Tharyx setigera
Typosyllis corallicoloides
Archiannelida
Polygordius sp.

SIPUNCULIDA
Aspidosiphon cf. *speciosus*
Phascolion strombi

ECHIUROIDA
Thalassema hartmani

ARTHROPODA
Crustacea
Malacostraca
Stomatopoda
Squilla empusa
Amphipoda
Ampelisca abdita
Amphipoda C
Amphipoda (Red Eyes)
Amphipoda, Long 6th Leg
Amphipoda, unID
Ampithoe sp.
Argissa agmatipes
Batea cartharinensis
Corophium acherusicum
Corophium louisianum
Leptocheirus sp.
Listriella sp.
Monoculoides sp.
Photis sp.
Isopoda
Aegethoa oculata
Tanaidacea
Elasmopus rapax
Tanaidacea
Cumacea
Oxyurostylis salinoi

ARTHROPODA (continued)
Mysidacea
Bowmaniella brasiliensis
Decapoda
Acetes americanus
Albunea paratii
Alpheus floridanus
Automate evermanni
Brachyura post larva
Callianassa acanthochirus
Callianassa latispina
Callianassa sp.
Callinectes similis
Caridea B
Crab - unID
Decapoda (post larva)
Euceramus praelongus
Goneplacidae
Grapsidae
Hepatus epheliticus
Hexapanopeus augustifrons
Isocheles wurdemanni
Latreutes parvulus
Leipdopa benedicti
Leptochela serratorbita
Micropanope nuttingi
Micropanope texana
Neopanope texana
Nephropsidae
Ogyrides limicola
Pagurus annulipes
Pagurus pollicaris
Panopeus turgidus
Persephona crinata
Pinnixa cristata
Pinnixa lunzi
Pinnotheridae A
Portunidae
Spiocarcinus lobatus
Xanthidae

ECHINODERMATA
Holothuroidea
Thyone briareus
Ophiuroidea
Hemipholis elongata
Micropholis atra

Table E1 (continued)

HEMICHORDATA
- *Balanoglossus* sp.

CEPHALOCHORDATA
- *Branchiostoma caribaeum*

CHORDATA
- Osteichthys
  - *Bascanichthys teres*

SEDIS
- Giant Sperm
- Incertae sedis
- unID Black Beast

TABLE E2
EXPERIMENTAL STUDY BENTHIC DATA: PRE-DISPOSAL PHASE SAMPLES.
NUMBER OF INDIVIDUALS/SQ.M. OF EACH SPECIES COLLECTED AT STATION 2-1 ON 14 JUL 75

SURF TEMP	SURF SAL	BOT TEMP	BOT SAL	DEPTH	SED TEMP	TIME ON	TIME OFF
30.0				9.0	23.5	1410	1450

SEDIMENTS: SAND WITH SHELL HASH

SPECIES	REPLICATES									
	1		2		3		4		5	
	ADLT	YNG	ADLT	YNG	ADLT	YNG	ADLT	YNG	ADLT	YNG
1 REPLICATES NOT ANALYZED			****	****			****	****		
2 NEREIS SP	80	112				144			16	112
3 MAGELONA SP	272				32					
4 ABRA AEQUALIS	144	80				16				48
5 BRANCHIOSTOMA CARIBAEUM		32				128				112
6 MAGELONA RIOJAI	16				176					
7 PRIONOSPIO PINNATA	64					64				
8 PHORONIS ARCHITECTA	112									
9 AMPELISCA ABDITA	96									
10 NEPHTYS PICTA	32					64				
11 SCOLEPSIS SQUAMATA		32				32				32
12 MICROPHOLIS ATRA		64								16
13 MEDIOMASTUS CALIFORNIENSIS	80									
14 DIOPATRA CUPREA		64								
15 MAGELONA ROSEA									64	
16 NEMERTEA (YELLOW BANDED)	16	16				32				
17 ANEMONE UN ID	16	16								16
18 NASSARIUS ACUTUS	16	32								
19 ELECTRA CRUSTULENTA (COL)	48									
20 MYSELLA PLANULATA					48					
21 CEREBRATULUS LACTEUS		32								
22 NATICA PUSILLA	16	16								
23 ANAITIDES ERYTHROPHYLLUS	32									
24 EDWARDSIA SP		16								16
25 ARICIDEA SP		16								
26 COSSURA DELTA		16								
27 PARANTHUS RAPIFORMIS		16								
28 NEMERTEA (WHITE)	16									
29 PAGURUS ANNULIPES		16								
30 OWENIA FUSIFORMIS	16									
31 TELLINA IRIS		16								
32 HEMIPHOLIS ELONGATA						16				
33 SPIOPHANES BOMBYX					16					
34 NEREIS SUCCINEA										16
35 ELECTRA SP (COLONIES)									16	
36 NEMATODA										16
TOTAL NUMBER OF INDIVIDUALS	1072	592			272	496			96	384

TABLE E3
EXPERIMENTAL STUDY BENTHIC DATA: PRE-DISPOSAL PHASE SAMPLES.
NUMBER OF INDIVIDUALS/SQ.M. OF EACH SPECIES COLLECTED AT STATION 2-2 ON 14 JUL 75

SURF TEMP	SURF SAL	BOT TEMP	BOT SAL	DEPTH	SED TEMP	TIME ON	TIME OFF
28.5				10.0	26.0	1055	1125

SEDIMENTS: SANDY SHELL OVER CLAY

SPECIES	REPLICATES									
	1		2		3		4		5	
	ADLT	YNG	ADLT	YNG	ADLT	YNG	ADLT	YNG	ADLT	YNG
1 REPLICATES NOT ANALYZED			****	****						
2 PRIONOSPIO PINNATA		192			112	32	96	96	256	
3 MEDIOMASTUS CALIFORNIENSIS	96				32		272		48	
4 MAGELONA SP	96				48		96		48	
5 GLYCINDE SOLITARIA	16				64				64	
6 DIOPATRA CUPREA	16	16			16				16	32
7 LUMBRINERIS TENUIS	32								32	16
8 NEMERTEA (YELLOW BANDED)	32						48			
9 CEREBRATULUS LACTEUS	16	32					16			
10 SIGAMBRA TENTACULATA		32				16		16		
11 NEREIS SP	16				16				16	
12 ABRA AEQUALIS						16		32		
13 NEMERTEA (YELLOW & PURPLE)							48			
14 NEMERTEA (YELLOW BANDED)							48			
15 PSEUDEURYTHOE AMBIGUA	16								16	
16 NOTOMASTUS LATERICEUS							32			
17 COSSURA DELTA							32			
18 SIGAMBRA WASSI							16	16		
19 MICROPHOLIS ATRA					16					
20 STYLOCHUS ELLIPTICUS									16	
21 OWENIA FUSIFORMIS								16		
22 AGLAOPHAMUS VERRILLI	16									
23 CLYMENELLA ZONALIS	16									
24 HEMIPHOLIS ELONGATA		16								
25 ANCISTROSYLLIS JONESI		16								
26 EUNOE SP					16					
27 NOTOMASTUS HEMIPODUS					16					
28 NATICA PUSILLA							16			
29 NINOE NIGRIPES								16		
30 NASSARIUS ACUTUS								16		
31 PETRICOLA PHOLADIFORMIS								16		
32 BALANOGLOSSUS									16	
33 NEMERTEA (WHITE)									16	
34 ETEONE HETEROPODA									16	
TOTAL NUMBER OF INDIVIDUALS	368	304			336	64	720	224	560	48

TABLE E4
EXPERIMENTAL STUDY BENTHIC DATA: PRE-DISPOSAL PHASE SAMPLES.
NUMBER OF INDIVIDUALS/SQ.M. OF EACH SPECIES COLLECTED AT STATION 2-3 ON 14 JUL 75

SURF TEMP	SURF SAL	BOT TEMP	BOT SAL	DEPTH	SED TEMP	TIME ON	TIME OFF
30.0				11.0	26.0	1150	1245

SEDIMENTS: GRAY CLAY

SPECIES	REPLICATES									
	1		2		3		4		5	
	ADLT	YNG	ADLT	YNG	ADLT	YNG	ADLT	YNG	ADLT	YNG
1 MEDIOMASTUS CALIFORNIENSIS	224				272				368	
2 MAGELONA SP	112		16		224	16			352	
3 PRIONOSPIO PINNATA	160		16		112		16		64	
4 DIOPATRA CUPREA			48		48		16		64	80
5 SIGAMBRA WASSI	32				16		16		128	
6 COSSURA DELTA	80				48				64	
7 NEMERTEA (YELLOW BANDED)	32				48				64	
8 ANCISTROSYLLIS JONESI									112	
9 LUMBRINERIS TENUIS	16				16	16				48
10 CEREBRATULUS LACTEUS					48				48	
11 ABRA AEQUALIS	16	16				48				
12 NUCULANA CONCENTRICA		32				32				
13 LISTRIELLA SP					32					
14 NOTOMASTUS LATERICEUS					16		16			
15 NEMERTEA (YELLOW & PURPLE)					16				16	
16 AMPELISCA ABDITA			16							
17 ANACHIS OBESA		16								
18 CALLIANASSA LATISPINA					16					
19 ARICIDEA SP					16					
20 CLYMENELLA ZONALIS					16					
21 LEPIDASTHENIA SP							16			
22 SPIOCHAETOPTERUS OCULATUS									16	
23 GYPTIS VITTATA									16	
24 NASSARIUS ACUTUS								16		
TOTAL NUMBER OF INDIVIDUALS	672	64	96		944	112	80	16	1312	128

TABLE E5
EXPERIMENTAL STUDY BENTHIC DATA: PRE-DISPOSAL PHASE SAMPLES.
NUMBER OF INDIVIDUALS/SQ.M. OF EACH SPECIES COLLECTED AT STATION 2-4 ON 14 JUL 75

SURF TEMP	SURF SAL	BOT TEMP	BOT SAL	DEPTH	SED TEMP	TIME ON	TIME OFF
30.0				9.0	26.0	1300	1335

SEDIMENTS: SILT OVER SAND OVER SOFT GRAY CLAY

SPECIES	REPLICATES									
	1		2		3		4		5	
	ADLT	YNG	ADLT	YNG	ADLT	YNG	ADLT	YNG	ADLT	YNG
1 REPLICATES NOT ANALYZED			****	****						
2 PRIONOSPIO PINNATA	112	288			496	160	48	64	128	
3 MAGELONA SP	240				240		48		176	
4 MEDIOMASTUS CALIFORNIENSIS	128				320		144		96	
5 DIOPATRA CUPREA	80	48					32		16	
6 LUMBRINERIS TENUIS		16				32				64
7 HEMIPHOLIS ELONGATA	32	48						16		
8 ABRA AEQUALIS		80						16		
9 GLYCERA AMERICANA					16	16			32	
10 PHORONIS ARCHITECTA							32		32	
11 NEREIS SP						32			16	
12 NATICA PUSILLA	16						16		16	
13 NASSARIUS ACUTUS	16				16				16	
14 OWENIA FUSIFORMIS	16				16		16			
15 NEREIS SUCCINEA		48								
16 NEMERTEA (YELLOW BANDED)					16		32			
17 CEREBRATULUS LACTEUS	16								16	
18 MULINIA LATERALIS		16					16			
19 PHASCOLION STROMBI	16						16			
20 PSEUDEURYTHOE AMBIGUA		16						16		
21 SIGAMBRA TENTACULATA					16			16		
22 NOTOMASTUS LATERICEUS							16		16	
23 NINOE NIGRIPES									32	
24 CERATOCEPHALE SP.					16					
25 AMPELISCA ABDITA									16	
26 CLYMENELLA ZONALIS										16
27 TEREBRA PROTEXTA	16									
28 PORTUNIDAE		16								
29 ELECTRA CRUSTULENTA (COL)	16									
30 MICROPHOLIS ATRA		16								
31 AMPHARETE (EYES)	16									
32 POLYDORA SOCIALIS	16									
33 GLYCINDE SOLITARIA							16			
34 NEMERTEA (YELLOW & PURPLE)							16			
35 ANCISTROSYLLIS HARTMANAE								16		
36 STHENELAIS BOA									16	
TOTAL NUMBER OF INDIVIDUALS	736	592			1152	240	448	144	624	80

TABLE E6
EXPERIMENTAL STUDY BENTHIC DATA: PRE-DISPOSAL PHASE SAMPLES.
NUMBER OF INDIVIDUALS/SQ.M. OF EACH SPECIES COLLECTED AT STATION 2-5 ON 14 JUL 75

SURF TEMP	SURF SAL	BOT TEMP	BOT SAL	DEPTH	SED TEMP	TIME ON	TIME OFF
30.0				10.0	26.0	1345	1420

SEDIMENTS: BROWN SILT OVER SAND OVER GRAY CLAY

SPECIES	REPLICATES									
	1		2		3		4		5	
	ADLT	YNG	ADLT	YNG	ADLT	YNG	ADLT	YNG	ADLT	YNG
1 REPLICATES NOT ANALYZED			****	****			****	****		
2 MEDIOMASTUS CALIFORNIENSIS	80				128				416	
3 MAGELONA SP	128				64				384	
4 PRIONOSPIO PINNATA	64	96			32	32			224	
5 LUMBRINERIS TENUIS	16	64				32				80
6 CLYMENELLA ZONALIS									144	
7 NEMERTEA (YELLOW BANDED)					32				96	
8 NOTOMASTUS LATERICEUS	16				32				64	
9 PHORONIS ARCHITECTA					32				64	
10 HEMIPHOLIS ELONGATA		32								48
11 DIOPATRA CUPREA	16				32					16
12 SPIOPHANES BOMBYX					32				32	
13 MICROPHOLIS ATRA	32								16	
14 CEREBRATULUS LACTEUS	16				16					16
15 TELLINA VERSICOLOR										32
16 ANCISTROSYLLIS JONESI		16							16	
17 NEREIS SP	16								16	
18 AMPELISCA ABDITA		16							16	
19 GLYCERA AMERICANA						16			16	
20 NEMERTEA (YELLOW & PURPLE)									32	
21 OWENIA FUSIFORMIS									32	
22 LEPIDOPA BENEDICTI		16								
23 GLYCINDE SOLITARIA									16	
24 THARYX SETIGERA									16	
25 ARICIDEA SP	16									
26 NEPHTYS PICTA		16								
27 AGLAOPHAMUS VERRILLI					16					
28 PANDORA TRILINEATA									16	
29 ANACHIS OBESA									16	
30 SOLEN VIRIDIS									16	
TOTAL NUMBER OF INDIVIDUALS	400	256			416	80			1648	192

TABLE E7
EXPERIMENTAL STUDY BENTHIC DATA: PRE-DISPOSAL PHASE SAMPLES.
NUMBER OF INDIVIDUALS/SQ.M. OF EACH SPECIES COLLECTED AT STATION 15-1 ON 24 JUL 75

SURF TEMP	SURF SAL	BOT TEMP	BOT SAL	DEPTH	SED TEMP	TIME ON	TIME OFF
30.0	32.0	28.5			27.5	1640	1710

SEDIMENTS: NO RECORD

SPECIES	REPLICATES 1 ADLT	1 YNG	2 ADLT	2 YNG	3 ADLT	3 YNG	4 ADLT	4 YNG	5 ADLT	5 YNG
1 MAGELONA SP	688		480	32	528		368	32	272	
2 PRIONOSPIO PINNATA		160		352	112	48	80	80		368
3 DIOPATRA CUPREA	128	96	64		64		128	48	176	16
4 MEDIOMASTUS CALIFORNIENSIS	96		256		80		96		48	
5 HEMIPHOLIS ELONGATA		160					48	160		144
6 NEREIS SP	16	32	48		64	16	96		32	16
7 SPIOPHANES BOMBYX	256						16			
8 NEREIS SUCCINEA		128	16			16	48			32
9 GLYCINDE SOLITARIA			16		32		32		64	
10 PARANTHUS RAPIFORMIS	16							48		64
11 NEMERTEA (YELLOW BANDED)	32		16				48		32	
12 NOTOMASTUS LATERICEUS	32						48		32	
13 AMPELISCA ABDITA	32	32							16	
14 OWENIA FUSIFORMIS	48						16		16	
15 ABRA AEQUALIS		48								32
16 STHENELAIS BOA	32						48			
17 ANADARA TRANSVERSA		32					32			16
18 CEREBRATULUS LACTEUS		16		32			16		16	
19 BUNODACTIS TEXENSIS			16					16	32	16
20 THARYX SETIGERA		32					16			
21 SPIOCHAETOPTERUS OCULATUS	16				16				16	
22 NATICA PUSILLA		16					32			
23 LUMBRINERIS TENUIS		16		16						16
24 NEMERTEA (YELLOW & PURPLE)	32									
25 GLYCERA AMERICANA	16		16							
26 BALANOGLOSSUS			32							
27 NEMERTEA (YELLOW & BROWN)			16				16			
28 NASSARIUS ACUTUS					16		16			
29 DECAPODA (POST LARVA)								32		
30 TELLINA IRIS										32
31 ANEMONE A	16						16			
32 INCERTAE SEDIS	16									
33 MALACOCEROS SP		16								
34 PINNIXA CRISTATA	16									
35 NEPHTYS MAGELLANICA	16									
36 LUNARCA OVALIS		16								
37 ARICIDEA SP			16							
38 NOTOMASTUS HEMIPODUS							16			
39 ANCISTROSYLLIS JONESI									16	
TOTAL NUMBER OF INDIVIDUALS	1504	800	992	432	912	80	1232	416	768	752

TABLE E8
EXPERIMENTAL STUDY BENTHIC DATA: PRE-DISPOSAL PHASE SAMPLES.
NUMBER OF INDIVIDUALS/SQ.M. OF EACH SPECIES COLLECTED AT STATION 15-2 ON 25 JUL 75

SURF TEMP	SURF SAL	BOT TEMP	BOT SAL	DEPTH	SED TEMP	TIME ON	TIME OFF
	33.0			10.0		1500	1520

SEDIMENTS: SHELL AND SAND OVER GRAY CLAY

SPECIES	REPLICATES									
	1		2		3		4		5	
	ADLT	YNG	ADLT	YNG	ADLT	YNG	ADLT	YNG	ADLT	YNG
1 PRICNOSPIO PINNATA	608	256	384	96		64	192		112	208
2 MAGELONA SP	192		384		112		592	16	448	
3 MEDIOMASTUS CALIFORNIENSIS			128		32		48		288	
4 DIOPATRA CUPREA	48	64	16		64	32	144	32	16	16
5 NEMERTEA (YELLOW BANDED)	16		96		32		32		32	
6 SIGAMBRA TENTACULATA				48		16	32			64
7 GLYCINDE SOLITARIA					48		48		32	
8 NEREIS SUCCINEA		32	16			16	16			16
9 LUMBRINERIS TENUIS			16			48		32		
10 NEREIS SP			32				16		16	
11 CEREBRATULUS LACTEUS	16				32					
12 BUNODACTIS TEXENSIS	16		16				16			
13 TELLINA VERSICOLOR				48						
14 ANCISTROSYLLIS JONESI			16		16	16				
15 PSEUDEURYTHOE AMBIGUA		16								16
16 CALLINECTES SIMILIS						16				16
17 ABRA AEQUALIS								16		16
18 NASSARIUS ACUTUS	16									
19 EDWARDSIA SP		16								
20 DRILONEREIS MAGNA			16							
21 PINNIXA CRISTATA							16			
22 PELECYPODA							16			
23 PINNIXA LUNZI							16			
24 SPIOPHANES BOMBYX							16			
25 CLYMENELLA ZONALIS									16	
26 AMPELISCA ABDITA										16
27 NEMERTEA (YELLOW & PURPLE)									16	
28 GRUBEULEPIS SP									16	
29 GYPTIS VITTATA										16
30 PHORONIS ARCHITECTA			16							
TOTAL NUMBER OF INDIVIDUALS	912	384	1136	192	336	208	1200	96	992	384

TABLE E9
EXPERIMENTAL STUDY BENTHIC DATA: PRE-DISPOSAL PHASE SAMPLES.
NUMBER OF INDIVIDUALS/SQ.M. OF EACH SPECIES COLLECTED AT STATION 15-3 ON 24 JUL 75

SURF TEMP	SURF SAL	BOT TEMP	BOT SAL	DEPTH	SED TEMP	TIME ON	TIME OFF
30.0	32.0	28.5		10.0	28.0	1600	1630

SEDIMENTS: SAND AND SHELL

SPECIES	REPLICATES									
	1		2		3		4		5	
	ADLT	YNG	ADLT	YNG	ADLT	YNG	ADLT	YNG	ADLT	YNG
1 MAGELONA SP	144		368	64	176		432	64	608	
2 PRIONOSPIO PINNATA	368	32	224		160	224	160			80
3 MEDIOMASTUS CALIFORNIENSIS	80		32		80		48		160	
4 DIOPATRA CUPREA	16	16	80	16	32		32			
5 NEREIS SP			128			16	48			
6 GLYCINDE SOLITARIA	16		16		32				16	16
7 NEREIS SUCCINEA			32				16		16	16
8 NEMERTEA (YELLOW BANDED)	32		32							
9 SIGAMBRA TENTACULATA		16				32				
10 OWENIA FUSIFORMIS							32		16	
11 LUMBRINERIS TENUIS		16						32		
12 NOTOMASTUS HEMIPODUS	16		16				16			
13 BUNODACTIS TEXENSIS	16						16			
14 THARYX SETIGERA			16						16	
15 NOTOMASTUS LATERICEUS			32							
16 AGLAOPHAMUS VERRILLI					16				16	
17 PARANTHUS RAPIFORMIS							32			
18 AMPELISCA ABDITA							16		16	
19 ARICIDEA SP							32			
20 STHENELAIS BOA							32			
21 HEMIPHOLIS ELONGATA							32			
22 CEREBRATULUS LACTEUS					16		16			
23 LEPIDASTHENIA SP		16								
24 NEPHTYS PICTA			16							
25 PSEUDEURYTHOE AMBIGUA			16							
26 AMPHARETE (EYES)			16							
27 COROPHIUM ACHERUSICUM			16							
28 NINOE NIGRIPES			16							
29 NEMERTEA (YELLOW & BROWN)			16							
30 MULINIA LATERALIS						16				
31 MAGELONA RIOJAI							16			
32 ANADARA TRANSVERSA								16		
33 PECTINARIA GOULDII							16			
34 ASYCHIS ELONGATA							16			
35 DRILONEREIS LONGA									16	
36 SPIOPHANES BOMBYX									16	
37 CLYMENELLA ZONALIS									16	
38 SPIOCHAETOPTERUS OCULATUS									16	
39 MALACOCEROS SP									16	
40 ABRA AEQUALIS										16
41 PSEUDOPOLYDORA SP			16							
TOTAL NUMBER OF INDIVIDUALS	688	96	1088	80	512	288	1008	112	944	128

TABLE E10
EXPERIMENTAL STUDY BENTHIC DATA: PRE-DISPOSAL PHASE SAMPLES.
NUMBER OF INDIVIDUALS/SQ.M. OF EACH SPECIES COLLECTED AT STATION 15-4 ON 25 JUL 75

SURF TEMP	SURF SAL	BOT TEMP	BOT SAL	DEPTH	SED TEMP	TIME ON	TIME OFF
	34.0			10.0		1530	1545

SEDIMENTS: SHELL AND SAND OVER GRAY CLAY

SPECIES	REPLICATES									
	1		2		3		4		5	
	ADLT	YNG	ADLT	YNG	ADLT	YNG	ADLT	YNG	ADLT	YNG
1 PRIONOSPIO PINNATA		288	304	128	1184	144	112	96	496	160
2 MEDIOMASTUS CALIFORNIENSIS			800		688		16		112	
3 MAGELONA SP	528		224		112		80		288	
4 BALANOGLOSSUS				752		112				64
5 DIOPATRA CUPREA	80	112					32	96		
6 SIGAMBRA TENTACULATA				80		96		48		96
7 CEREBRATULUS LACTEUS		288								
8 PHORONIS ARCHITECTA	16			256						
9 NEMERTEA (YELLOW BANDED)	16		80		48		16		80	
10 NEREIS SP	48			32		16				32
11 NASSARIUS ACUTUS	48						16	48		16
12 NEREIS SUCCINEA		128								
13 AMPELISCA ABDITA	32				48					32
14 GLYCINDE SOLITARIA	16		64						16	16
15 ABRA AEQUALIS		16				16		16		32
16 LEPIDASTHENIA SP				80						
17 OWENIA FUSIFORMIS	48						16			
18 SPIOCHAETOPTERUS OCULATUS	16		32							
19 HEMIPHOLIS ELONGATA		48								
20 NATICA PUSILLA				32		16				
21 LUMBRINERIS TENUIS		48								
22 NINOE NIGRIPES		32								
23 PINNIXA CRISTATA				32						
24 PSEUDEURYTHOE AMBIGUA						32				
25 ORILONEREIS LONGA	16									
26 ANADARA TRANSVERSA		16								
27 PANOPEUS TURGIDUS		16								
28 CLYMENELLA ZONALIS			16							
29 TEREBRA PROTEXTA				16						
30 NEMERTEA (YELLOW & PURPLE)				16						
31 ANACHIS OBESA							16			
32 AMPHARETE (EYES)	16									
TOTAL NUMBER OF INDIVIDUALS	880	992	1520	1424	2080	432	304	304	992	448

TABLE E11

EXPERIMENTAL STUDY BENTHIC DATA: PRE-DISPOSAL PHASE SAMPLES.

NUMBER OF INDIVIDUALS/SQ.M. OF EACH SPECIES COLLECTED AT STATION 15-5 ON 23 JUL 75

SURF TEMP	SURF SAL	BOT TEMP	BOT SAL	DEPTH	SED TEMP	TIME ON	TIME OFF
30.0	31.0	29.0		10.0	28.0	1600	1645

SEDIMENTS: SAND AND SHELL

SPECIES	REPLICATES									
	1		2		3		4		5	
	ADLT	YNG	ADLT	YNG	ADLT	YNG	ADLT	YNG	ADLT	YNG
1 MEDIOMASTUS CALIFORNIENSIS	1120		1328		880		752		656	
2 PRIONOSPIO PINNATA		528	80	192	672	288	272	480	304	
3 MAGELONA SP	112		240		144		144		288	48
4 NEREIS SP	112	48	16	96		64		240	96	
5 DIOPATRA CUPREA	80	112	32	32	16			16	16	16
6 HEMIPHOLIS ELONGATA		192	32					16		16
7 NEREIS SUCCINEA		176		16					48	16
8 AMPELISCA ABDITA	80		48		16		48			
9 ABRA AEQUALIS		48		32		32		16		16
10 THARYX SETIGERA			48				32		32	
11 BALANOGLOSSUS				48		32		32		
12 GLYCINDE SOLITARIA	32		16			32		16		
13 LUMBRINERIS TENUIS				16		32		16		32
14 BUNODACTIS TEXENSIS		32		32						
15 SIGAMBRA TENTACULATA		16		16		32				
16 AGLAOPHAMUS VERRILLI					16		16		32	
17 CEREBRATULUS LACTEUS	16				32					16
18 PSEUDEURYTHOE AMBIGUA						48				
19 PARANTHUS RAPIFORMIS		16								16
20 NEMERTEA (YELLOW BANDED)			16		16					
21 SPIOCHAETOPTERUS OCULATUS			16						16	
22 STHENELAIS BOA	16									
23 GRUBEULEPIS SP	16									
24 NASSARIUS ACUTUS	16									
25 THYONE BRIAREUS	16									
26 GLYCERA AMERICANA		16								
27 XANTHIDAE		16								
28 PINNIXA CRISTATA		16								
29 TELLINIDAE		16								
30 CALLINECTES SIMILIS				16						
31 NATICA PUSILLA			16							
32 LEPIDASTHENIA SP				16						
33 MALACOCEROS SP						16				
34 STYLOCHUS ELLIPTICUS								16		
35 TELLINA IRIS								16		
36 ARICIDEA SP									16	
37 OWENIA FUSIFORMIS									16	
38 MAGELONA RIOJAI									16	
39 PISTA CRISTATA									16	
40 LEPIDOPA BENEDICTI										16
TOTAL NUMBER OF INDIVIDUALS	1616	1232	1888	512	1792	576	1264	864	1552	192

TABLE E12
EXPERIMENTAL STUDY BENTHIC DATA: PRE-DISPOSAL PHASE SAMPLES.
NUMBER OF INDIVIDUALS/SQ.M. OF EACH SPECIES COLLECTED AT STATION 14-1 ON 22 JUL 75

SURF TEMP	SURF SAL	BOT TEMP	BOT SAL	DEPTH	SED TEMP	TIME ON	TIME OFF
28.5	31.0	28.5	·	14.0	28.0	815	930

SEDIMENTS: GRAY SANDY MUD

SPECIES	REPLICATES 1 ADLT	1 YNG	2 ADLT	2 YNG	3 ADLT	3 YNG	4 ADLT	4 YNG	5 ADLT	5 YNG
1 BALANCGLOSSUS	2352		2576		1296		2288		3264	
2 LEPIDASTHENIA SP		432		384	128		288	96	560	176
3 MAGELONA SP	304		176		208		192		256	
4 PINNIXA CRISTATA	64	272	128	96	32	48	48	128	80	224
5 PHORONIS ARCHITECTA	480		80		32		176		192	
6 SIGAMBRA WASSI		112	112	48	32	224	48	64		304
7 ABRA AEQUALIS	16	128		128	16			160	16	288
8 LUMBRINERIS TENUIS	16	112	32	112		64	16	96	32	48
9 DIOPATRA CUPREA	112	16		48	16		48	16	112	96
10 HEMIPHOLIS ELONGATA			16	16			16	48	64	304
11 MEDIOMASTUS CALIFORNIENSIS	80				16		96		96	
12 CEREBRATULUS LACTEUS	32		32		32	64		96		32
13 PARAMYA SUBOVATA		176						32		
14 NINOE NIGRIPES	16			64	32	48				16
15 PRIONOSPIO PINNATA		16		16		48		48		16
16 SIGAMBRA TENTACULATA						48	32	32		32
17 MYSELLA PLANULATA	16		32		16		16		48	
18 NUCULANA CONCENTRICA	32			32	16			32		
19 CLYMENELLA TORQUATA CALIDA		32		16			16	48		
20 MICROPHOLIS ATRA		80								
21 NASSARIUS ACUTUS	32	16			16				16	
22 NEPHTYS PICTA		32						32		16
23 CLYMENELLA ZONALIS		16		32					32	
24 AMPELISCA ABDITA	48						16			
25 NEMERTEA (YELLOW BANDED)	16				32		16			
26 PHASCOLION STROMBI	32		16				16			
27 NATICA PUSILLA		16		16						16
28 TEREBRA PROTEXTA				16			32			
29 COSSURA DELTA					32		16			
30 NEREIS SP					16	16		16		
31 PRIONOSPIO CIRRIFERA					16			16		16
32 TELLINA IRIS								32		16
33 VOLVULELLA TEXASIANA	16						16			
34 GLYCINDE SOLITARIA	16						16			
35 BUNODACTIS TEXENSIS	16						16			
36 MACOMA TENTA		16								16
37 PSEUDEURYTHOE AMBIGUA			32							
38 ARICIDEA SP				16	16					
39 GIANT SPERM			32							
40 NOTOMASTUS LATERICEUS				16	16					
41 GLYCERA AMERICANA									16	16
42 CALLIANASSA ACANTHOCHIRUS	16									
43 PECTINARIA GOULDII		16								
44 NOTOMASTUS HEMIPODUS		16								
45 PETRICOLA PHOLADIFORMIS		16								
46 ANACHIS OBESA		16								
47 SQUILLA EMPUSA				16						
48 NEREIS SUCCINEA			16							
49 CREPIDULA SP				16						
50 VITRINELLA HELICOIDEA			16							
51 NEMERTEA (YELLOW & PURPLE)					16					
52 STYLOCHUS ELLIPTICUS					16					
53 DOSINIA DISCUS								16		
54 PANOPEUS TURGIDUS									16	
55 CANTHARUS CANCELLARIUS										16
56 ANADARA TRANSVERSA										16
57 LEPIDONOTUS SUBLEVIS									16	
58 ANCISTROSYLLIS JONESI									16	
59 GRAPSIDAE										16
60 AMPHARETE (EYES)										16
61 ANEMONE UN ID	16									
TOTAL NUMBER OF INDIVIDUALS	3728	1536	3296	1088	2048	560	3424	1008	4832	1696

TABLE E13
EXPERIMENTAL STUDY BENTHIC DATA: PRE-DISPOSAL PHASE SAMPLES.
NUMBER OF INDIVIDUALS/SQ.M. OF EACH SPECIES COLLECTED AT STATION 14-2 ON 22 JUL 75

SURF TEMP	SURF SAL	BOT TEMP	BOT SAL	DEPTH	SED TEMP	TIME ON	TIME OFF
28.5	31.0	28.5		14.0	28.0	1245	1325

SEDIMENTS: GRAY MUD

SPECIES	REPLICATES									
	1		2		3		4		5	
	ADLT	YNG	ADLT	YNG	ADLT	YNG	ADLT	YNG	ADLT	YNG
1 MAGELONA SP	128		240		80		128		336	80
2 LUMBRINERIS TENUIS		144		48		64	16	144	112	112
3 NUCULANA CONCENTRICA		112		176		96		160		
4 VITRINELLA HELICOIDEA	16		496							
5 PARAMYA SUBOVATA				304						
6 DIOPATRA CU[illegible]	32	48		32	16	16	48	48	64	
7 PRIO[illegible]		16		96				16	96	
8 NINOE [illegible]	32	48				32	16		48	16
9 AMPELISC[illegible]	32		32				16		32	
10 VOLVULELLA TEX[illegible]NA	32		32		32					
11 MICROPHOLIS ATRA				48		16		16	16	
12 CEREBRATULUS LACTEUS		80	16							
13 SIGAMBRA TENTACULATA		48		32						
14 MEDIOMASTUS CALIFORNIENSIS	16		32		16				16	
15 GLYCINDE SOLITARIA	16				16			16	16	
16 ABRA AEQUALIS		16						16		16
17 NATICA PUSILLA				48						
18 AMPHARETE (EYES)	16			16					16	
19 NEMERTEA (YELLOW BANDED)	32								16	
20 HEMIPHOLIS ELONGATA		16			16					
21 ANCISTROSYLLIS JONESI		16		16						
22 COSSURA DELTA	16								16	
23 GIANT SPERM			32							
24 ANTICLIMAX PILSBRYI			32							
25 NEPHTYS INCISA	16									
26 ANACHIS OBESA		16								
27 LEPIDASTHENIA SP	16									
28 PINNIXA CRISTATA				16						
29 SPIOCHAETOPTERUS OCULATUS			16							
30 NASSARIUS ACUTUS				16						
31 NOTOMASTUS LATERICEUS			16							
32 ARICIDEA SP				16						
33 NEMERTEA (YELLOW & PURPLE)			16							
34 OWENIA FUSIFORMIS						16				
35 ANADARA TRANSVERSA						16				
36 GLYCERA AMERICANA							16			
37 ELECTRA SP (COLONIES)							16			
38 TEREBRA PROTEXTA								16		
39 NEREIS SP							16			
40 GYPTIS VITTATA									16	
41 CLYMENELLA ZONALIS									16	
42 LUNARCA OVALIS	16									
43 SIGAMBRA WASSI					16					
TOTAL NUMBER OF INDIVIDUALS	416	560	960	864	192	256	272	432	816	224

TABLE E14
EXPERIMENTAL STUDY BENTHIC DATA: PRE-DISPOSAL PHASE SAMPLES.
NUMBER OF INDIVIDUALS/SQ.M. OF EACH SPECIES COLLECTED AT STATION 14-3 ON 22 JUL 75

SURF TEMP	SURF SAL	BOT TEMP	BOT SAL	DEPTH	SED TEMP	TIME ON	TIME OFF
29.0	31.0	28.5		14.0	28.0	1145	1235

SEDIMENTS: CLAY WITH SAND AND SHELL

SPECIES	REPLICATES									
	1		2		3		4		5	
	ADLT	YNG	ADLT	YNG	ADLT	YNG	ADLT	YNG	ADLT	YNG
1 MAGELONA SP	592		400		912		1248		592	
2 NUCULANA CONCENTRICA		224		96		64		272		368
3 LUMBRINERIS TENUIS		240		160	16	176		256		48
4 SIGAMBRA WASSI		160		16			48	320		
5 PRIONOSPIO PINNATA		32		16		160		64		192
6 ABRA AEQUALIS		32		32		80		128		96
7 AMPELISCA ABDITA	64		48		16		112		96	
8 NINOE NIGRIPES	16	16	16		64	112	64	16	32	
9 NASSARIUS ACUTUS	48				32		32	128	16	32
10 DIOPATRA CUPREA		64		32	32		48	48		64
11 SIGAMBRA TENTACULATA				32		144		32		64
12 MEDIOMASTUS CALIFORNIENSIS	16				128		16		96	
13 NEREIS SP			16		16		48	16	112	
14 VOLVULELLA TEXASIANA	32		16				112		32	
15 PHORONIS ARCHITECTA	48				32		32		64	
16 COSSURA DELTA		16			32		32	16	80	
17 GLYCINDE SOLITARIA	32		32		16		16			48
18 PHASCOLION STROMBI			16	16	16		64			
19 CEREBRATULUS LACTEUS								48		48
20 MICROPHOLIS ATRA		32		32		16		16		
21 NATICA PUSILLA		16						32		32
22 TEREBRA PROTEXTA			16	16				32		16
23 AMPHARETE (EYES)						32				32
24 ASYCHIS ELONGATA					16			16		16
25 LEPIDASTHENIA SP						16				32
26 VITRINELLA HELICOIDEA	32									
27 AMPHARETE ACUTIFRONS	32									
28 NEREIS SUCCINEA				32						
29 MAGELONA ROSEA					16		16			
30 OWENIA FUSIFORMIS						16				16
31 NOTOMASTUS LATERICEUS							32			
32 ANACHIS OBESA										32
33 EPITONIUM MULTISTRIATUM										32
34 CLYMENELLA ZONALIS										32
35 DOSINIA DISCUS		16								
36 ANAITIDES ERYTHROPHYLLUS	16									
37 GIANT SPERM			16							
38 NEMERTEA (YELLOW BANDED)					16					
39 STHENELAIS BOA						16				
40 BALANOGLOSSUS					16					
41 TURBONILLA INTERRUPTA								16		
42 CIRRATULUS HEDGPETHI							16			
43 FLABELLIGERIDAE SP							16			
44 TELLINA IRIS								16		
45 SQUILLA EMPUSA										16
46 STROMBIFORMIS BILINEATA										16
47 PAGURUS ANNULIPES				16						
48 CERATOCEPHALE SP.	16									
TOTAL NUMBER OF INDIVIDUALS	944	848	576	496	1376	832	1952	1472	1120	1232

TABLE E15
EXPERIMENTAL STUDY BENTHIC DATA: PRE-DISPOSAL PHASE SAMPLES.
NUMBER OF INDIVIDUALS/SQ.M. OF EACH SPECIES COLLECTED AT STATION 14-4 ON 22 JUL 75

SURF TEMP	SURF SAL	BOT TEMP	BOT SAL	DEPTH	SED TEMP	TIME ON	TIME OFF
30.0	31.0	28.5	99.0	14.0	28.0	1335	1420

SEDIMENTS: SOFT MUD, SHELL AT 40 CM

SPECIES	REPLICATES									
	1		2		3		4		5	
	ADLT	YNG	ADLT	YNG	ADLT	YNG	ADLT	YNG	ADLT	YNG
1 MAGELONA SP	64	320	464		192		800		128	64
2 NUCULANA CONCENTRICA		368		96		96		288	240	
3 LUMBRINERIS TENUIS		96		80		32	16	112		80
4 NINOE NIGRIPES	80		48	80		64		48	64	
5 PRIONOSPIO PINNATA	240		16							
6 CEREBRATULUS LACTEUS	16			64				80	48	
7 PINNIXA CRISTATA			16	32	32				96	
8 VOLVULELLA TEXASIANA	16		64		32		16		32	
9 BALANOGLOSSUS			128						32	
10 MEDIOMASTUS CALIFORNIENSIS	144									
11 ABRA AEQUALIS		96		16		16				
12 AMPELISCA ABDITA	32		16				32		16	
13 NASSARIUS ACUTUS	32						16	16	32	
14 LEPIDASTHENIA SP			80	16						
15 SIGAMBRA TENTACULATA			16		16			32	16	16
16 SIGAMBRA WASSI			16	16				48		
17 GLYCINDE SOLITARIA	16		16				32			
18 DIOPATRA CUPREA		16			32				16	
19 TEREBRA PROTEXTA			16			16		32		
20 AMPHARETE ACUTIFRONS	32								16	
21 NEREIS SP	32		16							
22 PHASCOLION STROMBI	16						32			
23 MICROPHOLIS ATRA		32	16							
24 MYSELLA PLANULATA			32						16	
25 PHORONIS ARCHITECTA			32		16					
26 STHENELAIS BOA									48	
27 NEMERTEA (YELLOW BANDED)	32									
28 MAGELONA ROSEA	16						16			
29 COSSURA DELTA			16				16			
30 NEREIS SUCCINEA						32				
31 VITRINELLA HELICOIDEA							32			
32 AMPHARETE (EYES)	32									
33 GLYCERA AMERICANA									32	
34 ANACHIS OBESA	16									
35 CIRRATULUS HEDGPETHI	16									
36 HEMIPHOLIS ELONGATA	16									
37 XANTHIDAE		16								
38 CLYMENELLA TORQUATA CALIDA			16							
39 ARMANDIA AGILIS			16							
40 ARICIDEA SP			16							
41 GYPTIS VITTATA			16							
42 EUNICEACEA							16			
43 EDWARDSIA SP								16		
44 CERATOCEPHALE SP.							16			
45 ACTEON PUNCTOSTRIATUS									16	
46 NEPHTYS PICTA									16	
TOTAL NUMBER OF INDIVIDUALS	848	944	1072	400	320	256	1040	672	864	160

TABLE E16
EXPERIMENTAL STUDY BENTHIC DATA: PRE-DISPOSAL PHASE SAMPLES.
NUMBER OF INDIVIDUALS/SQ.M. OF EACH SPECIES COLLECTED AT STATION 14-5 ON 22 JUL 75

SURF TEMP	SURF SAL	BOT TEMP	BOT SAL	DEPTH	SED TEMP	TIME ON	TIME OFF
29.0		28.5		14.5	28.0	945	1100

SEDIMENTS: THICK GRAY CLAY, LITTLE SAND

SPECIES	REPLICATES									
	1		2		3		4		5	
	ADLT	YNG	ADLT	YNG	ADLT	YNG	ADLT	YNG	ADLT	YNG
1 MAGELONA SP	240		224		144		224		80	
2 LUMBRINERIS TENUIS		96		48		80		128		48
3 NUCULANA CONCENTRICA		112		160		48				
4 CEREBRATULUS LACTEUS	64			80		16		96		16
5 DIOPATRA CUPREA	32		48	48	48		32	48		
6 SIGAMBRA TENTACULATA		32	112	16	32		16			
7 SIGAMBRA WASSI	16		32			16		32		64
8 MEDIOMASTUS CALIFORNIENSIS	48			32	16		16		16	
9 VOLVULELLA TEXASIANA	32		16				16		64	
10 AMPELISCA ABDITA	16				16		96			
11 MYSELLA PLANULATA									128	
12 PRIONOSPIO PINNATA	16	64			16			16		
13 ABRA AEQUALIS				16	16	32		48		
14 LEPIDASTHENIA SP									112	
15 PINNIXA CRISTATA									80	16
16 PHASCOLION STROMBI	32		16		16		32			
17 GLYCINDE SOLITARIA	16		32		32					
18 NINOE NIGRIPES	16		32		16			16		
19 BALANOGLOSSUS									80	
20 MICROPHOLIS ATRA	16	16		16				16		
21 PHORONIS ARCHITECTA	48									
22 NASSARIUS ACUTUS		16	16	16						
23 TEREBRA PROTEXTA				16				32		
24 STHENELAIS BOA	16							16		
25 VITRINELLA HELICOIDEA	16						16			
26 PALEONOTUS HETEROSETA	16									
27 NEREIS SP	16									
28 CEREBRATULUS LURIDUS	16									
29 CIRRATULUS HEDGPETHI			16							
30 NEREIS SUCCINEA			16							
31 AMPHARETE ACUTIFRONS			16							
32 ANACHIS OBESA						16				
33 LUNARCA OVALIS						16				
34 ANCISTROSYLLIS JONESI						16				
35 NATICA PUSILLA							16			
36 MAGELONA ROSEA							16			
37 SQUILLA EMPUSA										16
38 INCERTAE SEDIS									16	
39 SCOLOPLOS SP									16	
TOTAL NUMBER OF INDIVIDUALS	672	336	576	448	352	240	480	448	592	160

TABLE E17
EXPERIMENTAL STUDY BENTHIC DATA: PRE-DISPOSAL PHASE SAMPLES.
NUMBER OF INDIVIDUALS/SQ.M. OF EACH SPECIES COLLECTED AT STATION 12-1 ON 21 JUL 75

SURF TEMP	SURF SAL	BOT TEMP	BOT SAL	DEPTH	SED TEMP	TIME ON	TIME OFF
29.0				13.0	28.9	1415	1515

SEDIMENTS: ALL SEDIMENT SAMPLES APPEARED TO BE DREDGE SPOIL WITH CLAY, SHELL AND SAND

SPECIES	REPLICATES									
	1		2		3		4		5	
	ADLT	YNG	ADLT	YNG	ADLT	YNG	ADLT	YNG	ADLT	YNG
1 REPLICATES NOT ANALYZED			****	****			****	****		
2 MAGELONA SP	16	160			16				1072	
3 DIOPATRA CUPREA	288	368							16	160
4 NEREIS SUCCINEA		304								64
5 LUMBRINERIS TENUIS		112								160
6 ABRA AEQUALIS	16	160								80
7 ANADARA TRANSVERSA		144				16				96
8 MEDIOMASTUS CALIFORNIENSIS									208	
9 PRIONOSPIO PINNATA		48							16	96
10 NEMERTEA (YELLOW BANDED)	48								96	
11 NEREIS SP									96	32
12 CEREBRATULUS LACTEUS		16								80
13 XANTHIDAE	16	80								
14 ELECTRA CRUSTULENTA (COL)									96	
15 AMPELISCA ABDITA		16							64	
16 HEMIPHOLIS ELONGATA		32							48	
17 NATICA PUSILLA		16			16					48
18 SPIOCHAETOPTERUS OCULATUS	16								48	
19 PHASCOLION STROMBI					32				16	
20 BUNODACTIS TEXENSIS		32								16
21 ELECTRA SP (COLONIES)									48	
22 NINOE NIGRIPES									48	
23 CLYMENELLA ZONALIS		16							16	
24 VITRINELLA HELICOIDEA	16								16	
25 OWENIA FUSIFORMIS									32	
26 PHORONIS ARCHITECTA									32	
27 TEREBRA PROTEXTA					16					
28 COSSURA DELTA		16								
29 GLYCINDE SOLITARIA	16									
30 LEPIDASTHENIA SP		16								
31 PSEUDEURYTHOE AMBIGUA	16									
32 NEPHTYS PICTA	16									
33 STHENELAIS BOA		16								
34 EPITONIUM MULTISTRIATUM		16								
35 GYPTIS VITTATA		16								
36 POLYDORA SOCIALIS		16								
37 MAGELONA ROSEA									16	
38 MICROPHOLIS ATRA										16
39 ASYCHIS ELONGATA									16	
40 GIANT SPERM									16	
41 CLYMENELLA TORQUATA CALIDA									16	
42 FLABELLIGERIDAE SP										16
43 ARICIDEA SP									16	
TOTAL NUMBER OF INDIVIDUALS	464	1600			80	16			2048	864

TABLE E18
EXPERIMENTAL STUDY BENTHIC DATA: PRE-DISPOSAL PHASE SAMPLES.
NUMBER OF INDIVIDUALS/SQ.M. OF EACH SPECIES COLLECTED AT STATION 12-2 ON 21 JUL 75

SURF TEMP	SURF SAL	BOT TEMP	BOT SAL	DEPTH	SED TEMP	TIME ON	TIME OFF
						9999	9999

SEDIMENTS: BLACK MUD WITH GRAY CLAY AND SAND; VERY SOFT

SPECIES	REPLICATES									
	1		2		3		4		5	
	ADLT	YNG	ADLT	YNG	ADLT	YNG	ADLT	YNG	ADLT	YNG
1 REPLICATES NOT ANALYZED			****	****			****	****		
2 MAGELONA SP	240	96			208	80			160	
3 DIOPATRA CUPREA	64	80			48				16	
4 NUCULANA CONCENTRICA		160				16				
5 MEDIOMASTUS CALIFORNIENSIS	48	16			48				48	
6 PRIONOSPIO PINNATA	16	96								32
7 COSSURA DELTA	16	32			16	32				32
8 ABRA AEQUALIS		112								
9 LUMBRINERIS TENUIS		48				16				32
10 SIGAMBRA WASSI	16				16				48	
11 ANADARA TRANSVERSA		80								
12 NEMERTEA (YELLOW BANDED)		48				16			16	
13 NINOE NIGRIPES	32	48								
14 ANCISTROSYLLIS JONESI	16				16	16				16
15 CEREBRATULUS LACTEUS		48							16	
16 PHORONIS ARCHITECTA	64									
17 GLYCINDE SOLITARIA		32								16
18 HEMIPHOLIS ELONGATA		32								
19 LEPIDASTHENIA SP		32								
20 NEREIS SUCCINEA	16	16								
21 LISTRIELLA SP	16									
22 ANACHIS OBESA	16									
23 BALANOGLOSSUS	16									
24 NASSARIUS ACUTUS	16									
25 NATICA PUSILLA		16								
26 PINNIXA CRISTATA		16								
27 GYPTIS VITTATA		16								
28 LUNARCA OVALIS		16								
29 ASYCHIS ELONGATA	16									
30 SIGAMBRA TENTACULATA					16					
31 CLYMENELLA ZONALIS									16	
32 NEREIS SP										16
33 PHASCOLION STROMBI										16
34 ARICIDEA SP									16	
TOTAL NUMBER OF INDIVIDUALS	608	1040			368	176			336	160

TABLE E19
EXPERIMENTAL STUDY BENTHIC DATA: PRE-DISPOSAL PHASE SAMPLES.
NUMBER OF INDIVIDUALS/SQ.M. OF EACH SPECIES COLLECTED AT STATION 12-3 ON 21 JUL 75

SURF TEMP	SURF SAL	BOT TEMP	BOT SAL	DEPTH	SED TEMP	TIME ON	TIME OFF
				12.5		1320	1610

SEDIMENTS: CLAY WITH SAND AND SHELL

SPECIES	REPLICATES									
	1		2		3		4		5	
	ADLT	YNG	ADLT	YNG	ADLT	YNG	ADLT	YNG	ADLT	YNG
1 REPLICATES NOT ANALYZED			****	****			****	****		
2 NUCULANA CONCENTRICA		16								240
3 PINNIXA CRISTATA	16				96	48			32	16
4 CEREBRATULUS LACTEUS						128				80
5 SIGAMBRA WASSI		16			16	16				144
6 BALANOGLOSSUS	16				128				32	
7 MAGELONA SP	64				32				80	
8 MEDIOMASTUS CALIFORNIENSIS	48								16	96
9 LEPIDASTHENIA SP	16				80					48
10 DIOPATRA CUPREA	16				16	32			16	16
11 SIGAMBRA TENTACULATA		16				16				64
12 GLYCINDE SOLITARIA					48				48	
13 ANCISTROSYLLIS JONESI		16				32			16	16
14 AMPELISCA ABDITA					48				32	
15 NINOE NIGRIPES					32				32	
16 LUMBRINERIS TENUIS					16					48
17 PARAMYA SUBOVATA										64
18 PRIONOSPIO PINNATA									32	32
19 ABRA AEQUALIS						32				16
20 HEMIPHOLIS ELONGATA					16				32	
21 NEMERTEA (YELLOW BANDED)					16					32
22 NASSARIUS ACUTUS										48
23 OWENIA FUSIFORMIS					16					16
24 GLYCERA AMERICANA						16			16	
25 STHENELAIS BOA										32
26 NEREIS SP										32
27 NEREIS SUCCINEA									16	16
28 LUNARCA OVALIS										16
29 MELINNA MACULATA									16	
30 NEMERTEA (YELLOW & PURPLE)	16									
31 PHASCOLION STROMBI	16									
32 NATICA PUSILLA						16				
33 EDWARDSIA SP						16				
34 CARIDEA B						16				
35 ELECTRA SP (COLONIES)									16	
36 TEREBRA PROTEXTA										16
37 VOLVULELLA TEXASIANA									16	
38 ANADARA TRANSVERSA										16
39 POLYDORA SOCIALIS										16
40 SPIOCHAETOPTEPUS OCULATUS									16	
41 SQUILLA EMPUSA										16
42 CALLIANASSA ACANTHOCHIRUS									16	
TOTAL NUMBER OF INDIVIDUALS	208	64			560	368			480	1136

TABLE E20
EXPERIMENTAL STUDY BENTHIC DATA: PRE-DISPOSAL PHASE SAMPLES.
NUMBER OF INDIVIDUALS/SQ.M. OF EACH SPECIES COLLECTED AT STATION 12-4 ON 21 JUL 75

SURF TEMP	SURF SAL	BOT TEMP	BOT SAL	DEPTH	SED TEMP	TIME ON	TIME OFF
				12.5		1730	1830

SEDIMENTS: CLAY WITH SAND AND SHELL

SPECIES	REPLICATES 1 ADLT	1 YNG	2 ADLT	2 YNG	3 ADLT	3 YNG	4 ADLT	4 YNG	5 ADLT	5 YNG
1 REPLICATES NOT ANALYZED			****	****			****	****		
2 MAGELONA SP	336				224	80			304	
3 PRIONOSPIO PINNATA		224			64				240	
4 MEDIOMASTUS CALIFORNIENSIS	80				112				48	
5 AMPELISCA ABDITA	32				96				16	
6 NEMERTEA (YELLOW BANDED)	32				32				64	
7 LUMBRINERIS TENUIS		16			16	16			32	48
8 DIOPATRA CUPREA		32				16			32	32
9 GLYCINDE SOLITARIA	32				48				16	
10 PHORONIS ARCHITECTA	32				32				16	
11 COSSURA DELTA	16				64					
12 CEREBRATULUS LACTEUS					80					
13 NEREIS SP	16				32				16	
14 ABRA AEQUALIS		16			32					16
15 TEREBRA PROTEXTA					16					48
16 NASSARIUS ACUTUS	16									16
17 OWENIA FUSIFORMIS	16					16				
18 NINOE NIGRIPES	16				16					
19 ANCISTROSYLLIS JONESI	32									
20 HEMIPHOLIS ELONGATA									16	16
21 VITRINELLA HELICOIDEA									32	
22 POLINICES DUPLICATUS		16								
23 CALLIANASSA LATISPINA		16								
24 GIANT SPERM	16									
25 LOIMIA VIRIDIS	16									
26 SIGAMBRA TENTACULATA		16								
27 TELLINA VERSICOLOR					16					
28 PINNIXA CRISTATA						16				
29 AMPHARETE ACUTIFRONS						16				
30 LEPIDOPA BENEDICTI						16				
31 NEREIS SUCCINEA						16				
32 NOTOMASTUS LATERICEUS									16	
33 ASYCHIS ELONGATA									16	
34 ACETES AMERICANUS (CAR)									16	
35 NUCULANA CONCENTRICA									16	
36 ANADARA TRANSVERSA									16	
37 ARICIDEA SP									16	
38 NEMERTEA (YELLOW & PURPLE)									16	
TOTAL NUMBER OF INDIVIDUALS	688	336			880	192			944	176

TABLE E21
EXPERIMENTAL STUDY BENTHIC DATA: PRE-DISPOSAL PHASE SAMPLES.
NUMBER OF INDIVIDUALS/SQ.M. OF EACH SPECIES COLLECTED AT STATION 12-5 ON 21 JUL 75

SURF TEMP	SURF SAL	BOT TEMP	BOT SAL	DEPTH	SED TEMP	TIME ON	TIME OFF
29.0		28.0		12.5	28.0	1220	1345

SEDIMENTS: SOFT GRAY CLAY

SPECIES	REPLICATES									
	1		2		3		4		5	
	ADLT	YNG	ADLT	YNG	ADLT	YNG	ADLT	YNG	ADLT	YNG
1 REPLICATES NOT ANALYZED			****	****						
2 MAGELONA SP	160				352		560		64	
3 NUCULANA CONCENTRICA					32	96		128		16
4 DIOPATRA CUPREA	32				112	32	48		32	
5 ABRA AEQUALIS	16					112		32	32	
6 AMPELISCA ABDITA					128		32			
7 NASSARIUS ACUTUS					16		80	32		16
8 NUCULANA ACUTA	16							128		
9 GLYCINDE SOLITARIA					64		32		16	
10 MEDIOMASTUS CALIFORNIENSIS					80		16		16	
11 PRIONOSPIO PINNATA						16		64		32
12 CEREBRATULUS LACTEUS		48								32
13 LUMBRINERIS TENUIS		32					16	16	16	
14 SIGAMBRA TENTACULATA							48	32		
15 SIGAMBRA WASSI	16						32	16	16	
16 ANCISTROSYLLIS JONESI	32							16	16	
17 ELECTRA SP (COLONIES)					16				48	
18 NEREIS SUCCINEA		16				32				
19 OWENIA FUSIFORMIS								48		
20 MICROPHOLIS ATRA								32		
21 TEREBRA PROTEXTA							32			
22 NEREIS SP		16				16				
23 NATICA PUSILLA							16			
24 DOSINIA DISCUS		16								
25 POLYDORA SOCIALIS		16								
26 BUNODACTIS TEXENSIS						16				
27 UN ID BLACK BEAST					16					
28 NEMERTEA (YELLOW BANDED)					16					
29 COSSURA DELTA					16					
30 NINOE NIGRIPES					16					
31 SPIOCARCINUS LOBATUS						16				
32 POLYDORA SOCIALIS					16					
33 CALLIANASSA LATISPINA					16					
TOTAL NUMBER OF INDIVIDUALS	272	144			896	336	912	544	256	96

TABLE E22
EXPERIMENTAL STUDY BENTHIC DATA: PRE-DISPOSAL PHASE SAMPLES.
NUMBER OF INDIVIDUALS/SQ.M. OF EACH SPECIES COLLECTED AT STATION 27-1 ON 23 JUL 75

SURF TEMP	SURF SAL	BOT TEMP	BOT SAL	DEPTH	SED TEMP	TIME ON	TIME OFF
29.0		29.0			28.5	1055	1130

SEDIMENTS: BROWN OXIDIZED SILT OVER SOFT GRAY CLAY

SPECIES	REPLICATES									
	1		2		3		4		5	
	ADLT	YNG	ADLT	YNG	ADLT	YNG	ADLT	YNG	ADLT	YNG
1 MAGELONA SP			304	64	352	64	640		464	64
2 MEDIOMASTUS CALIFORNIENSIS	16		48		224		416		160	
3 PRIONOSPIO PINNATA		48			256			160	208	
4 DIOPATRA CUPREA	80	16	144		80		128	16	32	32
5 CEREBRATULUS LACTEUS				16		16		96		304
6 NUCULANA CONCENTRICA						160		64		48
7 SIGAMBRA TENTACULATA					48			112	96	
8 ABRA AEQUALIS	16						16	16	16	80
9 AMPELISCA ABDITA	16				16		32		64	
10 SIGAMBRA WASSI	16				16		32		48	
11 COSSURA DELTA					16			48	48	
12 ANCISTROSYLLIS JONESI		16	16		16			32	16	
13 ARICIDEA SP	16				32			16		
14 GLYCINDE SOLITARIA		16					16		32	
15 NEMERTEA (YELLOW BANDED)					16		16		32	
16 VOLVULELLA TEXASIANA							64			
17 MAGELONA RIOJAI			16							
18 LUMBRINERIS TENUIS								16		
19 STHENELAIS BOA								16		
20 HEMIPHOLIS ELONGATA								16		
21 PSEUDEURYTHOE AMBIGUA									16	
22 NEREIS SP									16	
23 NEREIS SUCCINEA									16	
24 NINOE NIGRIPES									16	
25 ACETES AMERICANUS (CAR)									16	
26 TELLINA IRIS									16	
27 VITRINELLA HELICCIDEA									16	
28 SQUILLA EMPUSA										16
29 PSEUDOPOLYDORA SP			16							
30 ANADARA TRANSVERSA						16				
31 AMPHARETE (EYES)					16					
TOTAL NUMBER OF INDIVIDUALS	160	96	544	80	1088	256	1360	608	1328	544

TABLE E23
EXPERIMENTAL STUDY BENTHIC DATA: PRE-DISPOSAL PHASE SAMPLES.
NUMBER OF INDIVIDUALS/SQ.M. OF EACH SPECIES COLLECTED AT STATION 27-2 ON 23 JUL 75

SURF TEMP	SURF SAL	BOT TEMP	BOT SAL	DEPTH	SED TEMP	TIME ON	TIME OFF
30.0		29.5			28.0	1305	1415

SEDIMENTS: BROWN OXIDIZED SILT OVER SOFT GRAY CLAY

SPECIES	REPLICATES 1 ADLT	1 YNG	2 ADLT	2 YNG	3 ADLT	3 YNG	4 ADLT	4 YNG	5 ADLT	5 YNG
1 MAGELONA SP	352		80	80	288		176	32	272	
2 MEDIOMASTUS CALIFORNIENSIS	128				208		112		208	
3 SIGAMBRA TENTACULATA	48	96	48	48	32	16	96	48	64	
4 PRIONOSPIO PINNATA		48		48		112	64	32	112	
5 CEREBRATULUS LACTEUS			16			64		16		208
6 DIOPATRA CUPREA	112	16	32	16	48		48	16		
7 NUCULANA CONCENTRICA				32		112		32	96	
8 ABRA AEQUALIS		16		16		80		64		16
9 SIGAMBRA WASSI	16		32	32			64		32	
10 LUMBRINERIS TENUIS		16	16		16	80				
11 GLYCINDE SOLITARIA	16		32				16		16	
12 ARICIDEA SP	16	32			32					
13 PINNIXA CRISTATA				64						
14 AMPELISCA ABDITA	16				16		16			
15 STHENELAIS BOA		32						16		
16 VOLVULELLA TEXASIANA			48							
17 VITRINELLA HELICOIDEA			32						16	
18 NINOE NIGRIPES			16		16				16	
19 LEPIDASTHENIA SP				16			16		16	
20 COSSURA DELTA					32				16	
21 TEREBRA PROTEXTA			16						16	
22 SPIOCARCINUS LOBATUS						32				
23 NEREIS SP						16			16	
24 NASSARIUS ACUTUS							32			
25 TELLINA IRIS									32	
26 AMPHARETE (EYES)					32					
27 NEPHTYS INCISA	16									
28 NEMERTEA (YELLOW BANDED)	16									
29 BALANOGLOSSUS			16							
30 GYPTIS VITTATA					16					
31 ARMANDIA AGILIS					16					
32 NEREIS SUCCINEA							16			
33 DRILONEREIS LONGA							16			
34 PISTA CRISTATA									16	
35 ANCISTROSYLLIS JONESI									16	
36 ANACHIS OBESA									16	
37 LISTRIELLA SP									16	
TOTAL NUMBER OF INDIVIDUALS	736	256	384	352	752	512	672	256	992	224

TABLE E24
EXPERIMENTAL STUDY BENTHIC DATA: PRE-DISPOSAL PHASE SAMPLES.
NUMBER OF INDIVIDUALS/SQ.M. OF EACH SPECIES COLLECTED AT STATION 27-3 ON 23 JUL 75

SURF TEMP	SURF SAL	BOT TEMP	BOT SAL	DEPTH	SED TEMP	TIME ON	TIME OFF
29.0		29.0			27.0	915	1030

SEDIMENTS: BROWN OXIDIZED SILT OVER SOFT GRAY CLAY

SPECIES	REPLICATES									
	1		2		3		4		5	
	ADLT	YNG	ADLT	YNG	ADLT	YNG	ADLT	YNG	ADLT	YNG
1 MAGELONA SP	192	48	160	64	112		16		144	
2 PRIONOSPIO PINNATA	64	16	16	80	128				160	
3 SIGAMBRA TENTACULATA	48	64	80	48	80				64	
4 CEREBRATULUS LACTEUS				32						320
5 DIOPATRA CUPREA	128		80		32	16	32		16	16
6 ANCISTROSYLLIS JONESI	16		144						144	
7 MEDIOMASTUS CALIFORNIENSIS	112		32		32				80	
8 SIGAMBRA WASSI	96		64	48	16				32	
9 NUCULANA CONCENTRICA		32		48	80			48		32
10 AMPELISCA ABDITA			32		112					
11 LUMBRINERIS TENUIS		32	16	16		16				48
12 VOLVULELLA TEXASIANA	48		32		16				16	
13 ABRA AEQUALIS		16						48		48
14 VITRINELLA HELICOIDEA	48				16					
15 BALANOGLOSSUS	16		16		16				16	
16 LISTRIELLA SP					32					16
17 ASYCHIS ELONGATA			16						16	
18 NEMERTEA (YELLOW BANDED)					16				16	
19 NASSARIUS ACUTUS							16		16	
20 SPIOCHAETOPTERUS OCULATUS	16									
21 NEREIS SP	16									
22 SPIOPHANES BOMBYX		16								
23 PARANTHUS RAPIFORMIS		16								
24 MAGELONA RIOJAI			16							
25 NOTOMASTUS LATERICEUS			16							
26 PINNIXA CRISTATA				16						
27 ARICIDEA SP					16					
28 GLYCINDE SOLITARIA					16					
29 GLYCERA AMERICANA					16					
30 AMPHARETE ACUTIFRONS					16					
31 MACOMA CONSTRICTA					16					
32 THARYX SETIGERA									16	
33 COSSURA DELTA									16	
34 NATICA PUSILLA									16	
35 EPITONIUM ANGULATUM									16	
36 ANEMONE UN ID								16		
37 AGRIPOMA TEXASIANA			16							
TOTAL NUMBER OF INDIVIDUALS	800	240	736	352	768	32	64	112	784	480

TABLE E25
EXPERIMENTAL STUDY BENTHIC DATA: PRE-DISPCSAL PHASE SAMPLES.
NUMBER OF INDIVIDUALS/SQ.M. OF EACH SPECIES COLLECTED AT STATION 27-4 ON 23 JUL 75

SURF TEMP	SURF SAL	BOT TEMP	BOT SAL	DEPTH	SED TEMP	TIME ON	TIME OFF
30.0		29.0			27.5	1435	1535

SEDIMENTS: BROWN OXIDIZED SILT OVER GRAY CLAY

SPECIES	REPLICATES									
	1		2		3		4		5	
	ADLT	YNG	ADLT	YNG	ADLT	YNG	ADLT	YNG	ADLT	YNG
1 VITRINELLA HELICOIDEA	16						1728		16	
2 MAGELONA SP	256		208		256		112		160	32
3 DIOPATRA CUPREA	16	16	240		112	32	80	16	128	48
4 PRIONOSPIO PINNATA	48	128	80		240		32	16	64	
5 MEDIOMASTUS CALIFORNIENSIS	160		64		112		32			
6 ABRA AEQUALIS		64		32		96		16		
7 ANCISTROSYLLIS JONESI	16	16	16		48			48		
8 SIGAMBRA TENTACULATA		48	16		32				32	
9 CEREBRATULUS LACTEUS				32		48				32
10 AMPELISCA ABDITA	16		64				16		16	
11 LUMBRINERIS TENUIS		16	16					32		16
12 SIGAMBRA WASSI			32		16		16		16	
13 COSSURA DELTA	48				16					
14 PARAMYA SUBOVATA									64	
15 STHENELAIS BOA			32						16	
16 PINNIXA CRISTATA							32		16	
17 LISTRIELLA SP			16						16	
18 NEREIS SP		16	16							
19 GLYCINDE SOLITARIA			16				16			
20 NUCULANA CONCENTRICA			16						16	
21 NASSARIUS ACUTUS								32		
22 TELLINA IRIS								16		16
23 THALASSEMA HARTMANI									32	
24 AMPHARETE (EYES)									16	
25 MAGELONA RIOJAI					16					
26 NINOE NIGRIPES					16					
27 ARICIDEA SP					16					
28 SPIOCHAETOPTERUS OCULATUS					16					
29 BUNODACTIS TEXENSIS								16		
30 LEPIDASTHENIA SP								16		
31 BALANOGLOSSUS									16	
32 AGLAOPHAMUS VERRILLI									16	
33 VOLVULELLA TEXASIANA									16	
34 NATICA PUSILLA									16	
TOTAL NUMBER OF INDIVIDUALS	576	304	832	64	896	176	2064	208	672	144

TABLE E26
EXPERIMENTAL STUDY BENTHIC DATA: PRE-DISPOSAL PHASE SAMPLES.
NUMBER OF INDIVIDUALS/SQ.M. OF EACH SPECIES COLLECTED AT STATION 27-5 ON 23 JUL 75

SURF TEMP	SURF SAL	BOT TEMP	BOT SAL	DEPTH	SED TEMP	TIME ON	TIME OFF
29.5		29.5			27.0	1200	1250

SEDIMENTS: OXIDIZED BROWN SILT OVER SOFT GRAY CLAY, SOME SAND LENSES

SPECIES	REPLICATES									
	1		2		3		4		5	
	ADLT	YNG	ADLT	YNG	ADLT	YNG	ADLT	YNG	ADLT	YNG
1 MAGELONA SP	128		288		400	80	464	176	288	
2 MEDIOMASTUS CALIFORNIENSIS	16		128		64		656		64	
3 PRIONOSPIO PINNATA		96	48	144	64	32	80	112	32	
4 SIGAMBRA TENTACULATA	112		16		96		48	48		128
5 SIGAMBRA WASSI	16		64	128	16				192	
6 CEREBRATULUS LACTEUS		16		224		80				96
7 ABRA AEQUALIS		16		96		32		48		48
8 NUCULANA CONCENTRICA		16		48		112		32		16
9 DIOPATRA CUPREA	48		48				16		64	
10 VOLVULELLA TEXASIANA	32		32	16			48		16	16
11 AMPELISCA ABDITA	64		32				16		16	
12 LUMBRINERIS TENUIS		16			16	16		16		64
13 ANCISTROSYLLIS JONESI		32			32		32			
14 NEMERTEA (YELLOW BANDED)					16			48	16	
15 VITRINELLA HELICOIDEA	16			16	16		16			
16 GLYCINDE SOLITARIA	16				16		16		16	
17 COSSURA DELTA							16	16	16	
18 NEPHTYS INCISA	16			16						
19 SQUILLA EMPUSA				16						16
20 PALEONOTUS HETEROSETA									32	
21 PINNIXA CRISTATA						32				
22 ELECTRA SP (COLONIES)	16									
23 MAGELONA ROSEA	16									
24 CIRRATULUS HEDGPETHI		16								
25 ASYCHIS ELONGATA				16						
26 STHENELAIS BOA						16				
27 ARICIDEA SP					16					
28 ANCISTROSYLLIS HARTMANAE					16					
29 TELLINA IRIS					16					
30 GYPTIS VITTATA							16			
31 PHORONIS ARCHITECTA							16			
32 LEPIDASTHENIA SP							16			
33 NINOE NIGRIPES								16		
34 PRIONOSPIO CIRRIFERA								16		
35 BRACHYURA POST LARVA									16	
36 CALLIANASSA SP										16
37 SPIOCHAETOPTERUS OCULATUS									16	
38 LISTRIELLA SP							16			
39 ANEMONE UN ID					16					
TOTAL NUMBER OF INDIVIDUALS	496	208	656	720	800	400	1472	528	784	400

TABLE E27
EXPERIMENTAL STUDY BENTHIC DATA: IMMEDIATE POST-DISPOSAL PHASE SAMPLES.
NUMBER OF INDIVIDUALS/SQ.M. OF EACH SPECIES COLLECTED AT STATION 2-1 ON 18 SEP 75

SURF TEMP	SURF SAL	BOT TEMP	BOT SAL	DEPTH	SED TEMP	TIME ON	TIME OFF
29.0	25.0	28.0	29.0	10.8	28.5	1330	1345

SEDIMENTS: MUDDY SAND WITH SOME GRAY CLAY WITH MUCH SHELL HASH.

SPECIES	REPLICATES									
	1		2		3		4		5	
	ADLT	YNG	ADLT	YNG	ADLT	YNG	ADLT	YNG	ADLT	YNG
1 MAGELONA SP	48	32	48		16		144		64	16
2 NEREIS SUCCINEA		16	64	16	32		48	32	16	80
3 OWENIA FUSIFORMIS	48		64						32	16
4 NOTOMASTUS LATERICEUS	48				48	16	16		16	
5 PRIONOSPIO PINNATA		32		16		16			16	32
6 MEDIOMASTUS CALIFORNIENSIS			16	16			48		32	
7 LUMBRINERIS TENUIS		16				32		32	16	
8 DIOPATRA CUPREA	32		16		16	16				
9 SPIOCARCINUS LOBATUS					32	48				
10 CLYTIA CORONATA (COLONIES)			64							
11 ELECTRA SP (COLONIES)			32				32			
12 GLYCERA AMERICANA	16		32							
13 GLYCINDE SOLITARIA	16				16				16	
14 NASSARIUS ACUTUS	16		16						16	
15 COROPHIUM ACHERUSICUM			16		32					
16 NEREIS SP							32		16	
17 ABRA AEQUALIS	16					16				
18 NUCULANA CONCENTRICA	16			16						
19 AGRIPOMA TEXASIANA				16		16				
20 NEMERTEA (YELLOW BANDED)	16									
21 ANADARA TRANSVERSA			16							
22 PARANTHUS RAPIFORMIS				16						
23 TELLINA ALTERNATA			16							
24 AMPHIPODA, UN ID			16							
25 PHORONIS ARCHITECTA					16					
26 OBELIA BICUSPIDATA (COL)					16					
27 AMPHIPODA C					16					
28 PSEUDOPOLYDORA SP						16				
29 OGYRIDES LIMICOLA					16					
30 CIRRATULUS HEDGPETHI					16					
31 CEREBRATULUS LACTEUS								16		
32 NEMERTEA (YELLOW BANDED)								16		
33 SIGAMBRA TENTACULATA								16		
34 THAPYX SETIGERA							16			
35 GIANT SPERM							16			
36 COSSURA DELTA										16
TOTAL NUMBER OF INDIVIDUALS	272	96	416	96	272	176	352	112	240	160

TABLE E28
EXPERIMENTAL STUDY BENTHIC DATA: IMMECIATE POST-CISPOSAL PHASE SAMPLES.
NUMBER OF INDIVIDUALS/SQ.M. OF EACH SPECIES COLLECTED AT STATION 2-2 CN 18 SEP 75

SURF TEMP	SURF SAL	BOT TEMP	BOT SAL	DEPTH	SED TEMP	TIME ON	TIME OFF
28.5	24.0	28.0	30.0	10.0	28.0	1350	1420

SEDIMENTS: HARD SAND WITH A LITTLE MUD

SPECIES	REPLICATES									
	1		2		3		4		5	
	ADLT	YNG	ADLT	YNG	ADLT	YNG	ADLT	YNG	ADLT	YNG
1 REPLICATES NOT ANALYZED			****	****			****	****		
2 PRIONOSPIO PINNATA					32	144			32	
3 DIOPATRA CUPREA	16	16			32	112				
4 MAGELONA SP	32					48				
5 MEDIOMASTUS CALIFORNIENSIS	80									
6 CEREBRATULUS LACTEUS		16			16	32				
7 NEMERTEA (YELLOW BANDED)		16			48					
8 NEREIS SUCCINEA	16					48				
9 GLYCINDE SOLITARIA					48					
10 COSSURA DELTA	16				16					
11 SPIOCHAETOPTERUS OCULATUS	16				16					
12 NEPHTYS INCISA						32				
13 ELECTRA SP (COLONIES)									32	
14 AMPHARETE (EYES)										16
15 PHASCOLION STROMBI	16									
16 PINNIXA CRISTATA		16								
17 SCOLOPLOS (LEODAMUS) RUBRA	16									
18 NUCULANA CONCENTRICA					16					
19 OWENIA FUSIFORMIS					16					
20 OXYUROSTYLIS SALINOI					16					
21 CLYMENELLA ZONALIS										16
TOTAL NUMBER OF INDIVIDUALS	208	64			256	416			64	32

TABLE E29
EXPERIMENTAL STUDY BENTHIC DATA: IMMEDIATE POST-DISPOSAL PHASE SAMPLES.
NUMBER OF INDIVIDUALS/SQ.M. OF EACH SPECIES COLLECTED AT STATION 2-3 ON 18 SEP 75

SURF TEMP	SURF SAL	BOT TEMP	BOT SAL	DEPTH	SED TEMP	TIME ON	TIME OFF
28.0	24.0	28.0	32.0	11.0	28.0	1430	1500

SEDIMENTS: SAND WITH A LITTLE MUD AND SHELL

SPECIES	REPLICATES									
	1		2		3		4		5	
	ADLT	YNG	ADLT	YNG	ADLT	YNG	ADLT	YNG	ADLT	YNG
1 REPLICATES NOT ANALYZED			****	****			****	****		
2 MAGELONA SP	128				80	32			128	112
3 PRIONOSPIO PINNATA	32	160				32			16	96
4 CEREBRATULUS LACTEUS		16				80				112
5 ARMANDIA AGILIS									112	32
6 COSSURA DELTA		96				32				
7 MEDIOMASTUS CALIFORNIENSIS	48				48				32	
8 PINNIXA CRISTATA									64	16
9 NEREIS SP									16	32
10 TEREBRA PROTEXTA	32									
11 NINOE NIGRIPES						16				16
12 BALANOGLOSSUS									32	
13 LEPIDASTHENIA SP									32	
14 NASSARIUS ACUTUS	16									
15 NEMERTEA (YELLOW & PURPLE)	16									
16 NUCULANA CONCENTRICA		16								
17 CALLIANASSA LATISPINA		16								
18 CLYMENELLA ZONALIS						16				
19 PSEUDEURYTHOE AMBIGUA						16				
20 ELECTRA SP (COLONIES)					16					
21 NEMERTEA (YELLOW BANDED)					16					
22 ANTICLIMAX PILSBRYI						16				
23 ANCISTROSYLLIS JONESI									16	
24 DIOPATRA CUPREA									16	
25 LUMBRINERIS TENUIS										16
26 PSEUDOPOLYDORA SP										16
27 AEGETHOA OCULATA									16	
28 GLYCINDE SOLITARIA									16	
TOTAL NUMBER OF INDIVIDUALS	272	304			160	240			496	448

TABLE E30
EXPERIMENTAL STUDY BENTHIC CATA: IMMECIATE POST-DISPOSAL PHASE SAMPLES.
NUMBER OF INDIVIDUALS/SQ.M. OF EACH SPECIES CCLLECTED AT STATION 2-4 ON 20 SEP 75

SURF TEMP	SURF SAL	BOT TEMP	BCT SAL	CEPTH	SED TEMP	TIME ON	TIME OFF
28.0	23.0	28.0	30.0	11.0	28.0	1002	1030

SEDIMENTS: MUDDY SAND AND GRAY CLAY

SPECIES	REPLICATES									
	1		2		3		4		5	
	ADLT	YNG	ADLT	YNG	ADLT	YNG	ADLT	YNG	ADLT	YNG
1 REPLICATES NOT ANALYZED			****	****			****	****		
2 MAGELCNA SP		64			224	336			80	48
3 DIOPATRA CUPREA	96	16			176	32			96	
4 LUMBRINERIS TENUIS		32			16	128				80
5 ANCISTROSYLLIS JONESI		16							80	
6 NEREIS SP		80							16	
7 ANADARA TRANSVERSA						80				
8 COSSURA DELTA	32					16				16
9 NUCULANA CONCENTRICA	32	16								
10 PINNIXA CRISTATA	16				16	16				
11 CEREBRATULUS LACTEUS						32				16
12 OWENIA FUSIFORMIS						48				
13 SPIOCARCINUS LCBATUS					16	32				
14 NASSARIUS ACUTUS									48	
15 NINCE NIGRIPES										48
16 HEMIPHOLIS ELONGATA	16					16				
17 PARAMYA SUBOVATA	32									
18 GLYCINDE SOLITARIA					16				16	
19 PHORONIS ARCHITECTA					16				16	
20 NOTOMASTUS LATERICEUS									16	16
21 PSEUDOPOLYDORA SP									16	16
22 PINNIXA LUNZI	16									
23 MELINNA MACULATA	16									
24 MEDIOMASTUS CALIFORNIENSIS					16					
25 CALLINECTES SIMILIS					16					
26 SPIOCHAETOPTERUS OCULATUS					16					
27 MAGELCNA RIOJAI					16					
28 BUNODACTIS TEXENSIS						16				
29 CALLIANASSA LATISPINA					16					
30 AMPELISCA ABDITA									16	
31 GLYCERA AMERICANA									16	
32 LEPIDASTHENIA SP									16	
33 NATICA PUSILLA										16
34 SIGAMBRA WASSI									16	
35 NEMERTEA (YELLOW BANDED)									16	
36 OXYUROSTYLIS SALINOI									16	
37 AMPHIPODA, UN ID									16	
38 THYONE BRIAREUS					16					
TOTAL NUMBER OF INDIVIDUALS	256	224			576	752			496	256

TABLE E31
EXPERIMENTAL STUDY BENTHIC DATA: IMMEDIATE POST-DISPOSAL PHASE SAMPLES.
NUMBER OF INDIVIDUALS/SQ.M. OF EACH SPECIES COLLECTED AT STATION 2-5 ON 20 SEP 75

SURF TEMP	SURF SAL	BOT TEMP	BOT SAL	DEPTH	SED TEMP	TIME ON	TIME OFF
28.0	25.0	28.0	30.0	11.0	28.5	1040	1130

SEDIMENTS: SANDY MUD & BEAUMONT CLAY, VERY HARD BOTTOM

SPECIES	REPLICATES									
	1		2		3		4		5	
	ADLT	YNG	ADLT	YNG	ADLT	YNG	ADLT	YNG	ADLT	YNG
1 REPLICATES NOT ANALYZED			****	****			****	****		
2 MAGELONA SP		32			128	96			112	80
3 LUMBRINERIS TENUIS	16	16				128				48
4 PHORONIS ARCHITECTA	48				48				32	
5 DIOPATRA CUPREA	32				16	16			16	
6 MEDIOMASTUS CALIFORNIENSIS	16				64					
7 ANADARA TRANSVERSA									16	64
8 ANCISTROSYLLIS JONESI	48									
9 NEREIS SP						32				16
10 NINOE NIGRIPES	32									
11 PAGURUS ANNULIPES						32				
12 PSEUDEURYTHOE AMBIGUA										32
13 NOTOMASTUS LATERICEUS						16				16
14 OWENIA FUSIFORMIS					32					
15 COSSURA DELTA		16								
16 NUCULANA CONCENTRICA		16								
17 PINNIXA CRISTATA		16								
18 PRIONOSPIO PINNATA		16								
19 EUCERAMUS PRAELONGUS	16									
20 VITRINELLA HELICCIDEA	16									
21 AMPELISCA ABDITA						16				
22 CEREBRATULUS LACTEUS						16				
23 SIGAMBRA WASSI						16				
24 TEREBRA PROTEXTA					16					
25 TELLINA VERSICOLOR						16				
26 ALBUNEA PARETII					16					
27 NEPHTYS PICTA					16					
28 SCOLOPLOS (LEODAMUS) RUBRA						16				
29 EUNOE SP						16				
30 SPIOPHANES BOMBYX					16					
31 ARMANDIA AGILIS					16					
32 GLYCINDE SOLITARIA										16
33 HEMIPHOLIS ELONGATA										16
34 NEMERTEA (YELLOW BANDED)									16	
35 NEREIS SUCCINEA										16
36 SOLEN VIRIDIS									16	
37 STHENELAIS BOA										16
38 SPIOCHAETOPTERUS OCULATUS									16	
TOTAL NUMBER OF INDIVIDUALS	224	112			368	416			224	320

TABLE E32
EXPERIMENTAL STUDY BENTHIC DATA: IMMECIATE POST-DISPOSAL PHASE SAMPLES.
NUMBER OF INDIVIDUALS/SQ.M. OF EACH SPECIES COLLECTED AT STATION 15-1 ON 18 SEP 75

SURF TEMP	SURF SAL	BOT TEMP	BOT SAL	DEPTH	SED TEMP	TIME ON	TIME OFF
28.0	24.0	27.5	28.0	10.0	28.0	905	930

SEDIMENTS: HARD SAND WITH LITTLE MUD

SPECIES	REPLICATES									
	1		2		3		4		5	
	ADLT	YNG	ADLT	YNG	ADLT	YNG	ADLT	YNG	ADLT	YNG
1 NEREIS SP	320	16	16		160	16			368	
2 MEDIOMASTUS CALIFORNIENSIS	160		176	16	64		240	32		
3 PRIONOSPIO PINNATA	48		96	64	48	48	64	16	80	
4 MAGELONA SP	48		112	16	160		48		16	
5 NEREIS SUCCINEA		16	80				112	112		
6 PINNIXA CRISTATA	16			160				16		16
7 PHORONIS ARCHITECTA			16						192	
8 HEMIPHOLIS ELONGATA			16				48	48	16	
9 DIOPATRA CUPREA			32	32	16	16		16		
10 PSEUDEURYTHOE AMBIGUA			16	64						
11 PISTA CRISTATA	64						16			
12 OXYUROSTYLIS SALINOI		16					16			32
13 TELLINA IRIS		48					16			
14 SIGAMBRA TENTACULATA				48						
15 MAGELONA RIOJAI			16				16		16	
16 NOTOMASTUS HEMIPODUS										48
17 SCOLOPLOS FOLIOSUS		32								
18 NASSARIUS ACUTUS			16				16			
19 NEMERTEA (YELLOW BANDED)			32							
20 OWENIA FUSIFORMIS			16				16			
21 BUNODACTIS TEXENSIS				16				16		
22 CIRRATULUS HEDGPETHI							32			
23 ANEMONE UN ID								16		
24 LEPIDASTHENIA SP				16						
25 AMPELISCA ABDITA	16									
26 THARYX SETIGERA	16									
27 AMPHARETE (EYES)	16									
28 OGYRIDES LIMICOLA		16								
29 LUMBRINERIS TENUIS				16						
30 PARANTHUS RAPIFORMIS			16							
31 SPIOCHAETOPTERUS OCULATUS			16							
32 STHENELAIS BOA				16						
33 MULINIA LATERALIS				16						
34 NOTOMASTUS LATERICEUS								16		
35 GYPTIS VITTATA								16		
36 ANADARA BRASILIANA							16			
37 AMPHIPODA, UN ID							16			
38 MICROPHOLIS ATRA							16			
39 CARIDEA B									16	
40 SINUM MACULATUM									16	
TOTAL NUMBER OF INDIVIDUALS	704	144	672	480	448	80	688	304	720	96

TABLE E33
EXPERIMENTAL STUDY BENTHIC DATA: IMMEDIATE POST-DISPOSAL PHASE SAMPLES.
NUMBER OF INDIVIDUALS/SQ.M. OF EACH SPECIES COLLECTED AT STATION 15-2 ON 18 SEP 75

SURF TEMP	SURF SAL	BOT TEMP	BOT SAL	DEPTH	SED TEMP	TIME ON	TIME OFF
28.0	24.0	28.0	29.0	10.0	28.0	940	1020

SEDIMENTS: HARD MUDDY SAND BOTTOM

SPECIES	REPLICATES									
	1		2		3		4		5	
	ADLT	YNG	ADLT	YNG	ADLT	YNG	ADLT	YNG	ADLT	YNG
1 PRIONOSPIO PINNATA	224	160	48	112	112	192			16	48
2 MAGELONA SP	16		112		224	32	32	16	96	48
3 MEDIOMASTUS CALIFORNIENSIS	128		16		32	32	32		16	
4 DIOPATRA CUPREA	16	80	16	16	16	16	16		16	16
5 GLYCINDE SOLITARIA	16			16		112			16	
6 PSEUDEURYTHOE AMBIGUA		48		48		32				
7 NEMERTEA (YELLOW BANDED)	48			16	16				16	
8 NINOE NIGRIPES		80								
9 PINNIXA CRISTATA		32		16						32
10 NEREIS SUCCINEA				48			16		16	
11 NEMERTEA (YELLOW & PURPLE)	16			16	32					
12 SIGAMBRA TENTACULATA		16		16		32				
13 OWENIA FUSIFORMIS			16		16				16	
14 NUCULANA CONCENTRICA		16				16				16
15 NEREIS SP						32	16			
16 SIGAMBRA WASSI						48				
17 CEREBRATULUS LACTEUS			16			16				
18 NOTOMASTUS LATERICEUS			32							
19 SPIOCHAETOPTERUS OCULATUS			16			16				
20 PARANTHUS RAPIFORMIS				32						
21 DOSINIA DISCUS						32				
22 BALANOGLOSSUS							16		16	
23 CRASSINELLA LUNULATA										16
24 GLYCERA AMERICANA	16									
25 PHASCOLION STROMBI	16									
26 OXYUROSTYLIS SALINOI	16									
27 ACETES AMERICANUS (CAR)			16							
28 AMPELISCA ABDITA						16				
29 CALLIANASSA LATISPINA					16					
30 ARMANDIA AGILIS						16				
31 ANADARA TRANSVERSA										16
32 NASSARIUS ACUTUS									16	
33 PRIONOSPIO CIRRIFERA										16
34 TEREBRA PROTEXTA										16
TOTAL NUMBER OF INDIVIDUALS	512	432	288	336	464	640	128	16	240	224

TABLE E34
EXPERIMENTAL STUDY BENTHIC DATA: IMMEDIATE POST-DISPOSAL PHASE SAMPLES.
NUMBER OF INDIVIDUALS/SQ.M. OF EACH SPECIES COLLECTED AT STATION 15-3 ON 18 SEP 75

SURF TEMP	SURF SAL	BOT TEMP	BOT SAL	DEPTH	SED TEMP	TIME ON	TIME OFF
28.0	24.0	27.5	29.0	10.0	28.0	825	900

SEDIMENTS: MUDDY SAND WITH SOME SHELL AND SOME GRAY CLAY

SPECIES	REPLICATES									
	1		2		3		4		5	
	ADLT	YNG	ADLT	YNG	ADLT	YNG	ADLT	YNG	ADLT	YNG
1 PRIONOSPIO PINNATA		32	16	16	144	416		48	16	16
2 MAGELONA SP	160	16	128	48	48		48	16	32	
3 MEDIOMASTUS CALIFORNIENSIS	64		256	16	32		32		16	
4 PSEUDOPOLYDORA SP	16	48			16				80	
5 PSEUDEURYTHOE AMBIGUA		48	16	80			16			
6 PINNIXA CRISTATA		64		16		32				32
7 LUMBRINERIS TENUIS	32			48		16		32		
8 SIGAMBRA TENTACULATA		16		32	16	16	16			16
9 GLYCINDE SOLITARIA	16				16	32				
10 DIOPATRA CUPREA	32			16						
11 NEREIS SP		16	16				16			
12 AGLAOPHAMUS VERRILLI			32			16				
13 NASSARIUS ACUTUS						48				
14 PERSEPHONA CRINATA	16					16				
15 OWENIA FUSIFORMIS			32							
16 NEMERTEA (YELLOW BANDED)				32						
17 LEPIDASTHENIA SP					16				16	
18 PHORONIS ARCHITECTA					16				16	
19 PARANTHUS RAPIFORMIS				16						
20 CLYMENELLA ZONALIS	16									
21 NOTOMASTUS LATERICEUS		16								
22 PINNIXA LUNZI	16									
23 CALLIANASSA LATISPINA		16								
24 ANCISTROSYLLIS JONESI				16						
25 NEREIS SUCCINEA				16						
26 BUNODACTIS TEXENSIS				16						
27 NEMERTEA (YELLOW BANDED)					16					
28 THALASSEMA HARTMANI					16					
29 TELLINA IRIS						16				
30 ARICIDEA SP						16				
TOTAL NUMBER OF INDIVIDUALS	368	272	496	368	336	624	128	96	176	64

TABLE E35
EXPERIMENTAL STUDY BENTHIC DATA: IMMEDIATE POST-DISPOSAL PHASE SAMPLES.
NUMBER OF INDIVIDUALS/SQ.M. OF EACH SPECIES COLLECTED AT STATION 15-4 ON 18 SEP 75

SURF TEMP	SURF SAL	BOT TEMP	BOT SAL	DEPTH	SED TEMP	TIME ON	TIME OFF
28.0	24.0	28.0	29.0		28.0	1035	1115

SEDIMENTS: BLACK MUD WITH GRAY CLAY AND SAND; VERY SOFT

SPECIES	REPLICATES									
	1		2		3		4		5	
	ADLT	YNG	ADLT	YNG	ADLT	YNG	ADLT	YNG	ADLT	YNG
1 MAGELONA SP	64	48	192	64	624	16	80	32	16	160
2 THALASSEMA HARTMANI	16		16		48		864		32	
3 PINNIXA CRISTATA		80	32	64	16	48	80	368	48	144
4 PSEUDEURYTHOE AMBIGUA				64		80	176	192	16	16
5 CEREBRATULUS LACTEUS		112		144		16			32	32
6 LEPIDASTHENIA SP			16			48	112	64		16
7 PARAMYA SUBOVATA					48		96		32	
8 NEREIS SP						80	16			80
9 PSEUDOPOLYDORA SP		64				80		16		
10 CORBULA DIETZIANA							96	48		
11 MEDIOMASTUS CALIFORNIENSIS	16				64					48
12 PINNIXA LUNZI	48						48	32		
13 DIOPATRA CUPREA			16	48				16	32	16
14 NASSARIUS ACUTUS	64						16		16	16
15 STHENELAIS BOA	16		16			16	64			
16 PRIONOSPIO PINNATA	16	32		32						
17 LUMBRINERIS TENUIS			16		16			32		16
18 OWENIA FUSIFORMIS						16		32		16
19 SIGAMBRA WASSI	16		16						16	
20 ANCISTROSYLLIS JONESI	16					16		16		
21 OXYUROSTYLIS SALINOI	48									
22 PHORONIS ARCHITECTA							16		32	
23 VITRINELLA HELICCIDEA							48			
24 SIGAMBRA TENTACULATA			16	16						
25 SPIOCHAETOPTERUS OCULATUS										32
26 HEMIPHOLIS ELONGATA		16							16	
27 GLYCINDE SOLITARIA			16		16					
28 BALANOGLOSSUS				16	16					
29 NINOE NIGRIPES						16			16	
30 POLYNOIDAE					32					
31 NEREIS SUCCINEA							16	16		
32 NOTOMASTUS LATERICEUS							32			
33 TELLINA VERSICOLOR								32		
34 ACETES AMERICANUS (CAR)			32							
35 MESOCHAETOPTERUS TAYLORI					16					
36 COSSURA DELTA										16
37 LUNARCA OVALIS									16	
38 TEREBRA PROTEXTA									16	
39 CORBULA BARRATTANIA									16	
40 BUNODACTIS TEXENSIS										16
41 CLYMENELLA TORQUATA CALIDA									16	
42 NUCULANA CONCENTRICA			16							
43 NEMERTEA (YELLOW BANDED)				16						
44 MULINIA LATERALIS			16							
45 BASCANICHTHYS TERES					16					
46 EDWARDSIA SP						16				
47 GLYCERA AMERICANA								16		
48 AMPELISCA ABDITA							16			
49 GYPTIS VITTATA								16		
50 BRACHYURA							16			
TOTAL NUMBER OF INDIVIDUALS	320	352	416	464	912	448	1792	928	368	624

TABLE E36
EXPERIMENTAL STUDY BENTHIC DATA: IMMECIATE POST-DISPOSAL PHASE SAMPLES.
NUMBER OF INDIVIDUALS/SQ.M. OF EACH SPECIES COLLECTED AT STATION 15-5 ON 18 SEP 75

SURF TEMP	SURF SAL	BOT TEMP	BOT SAL	DEPTH	SED TEMP	TIME ON	TIME OFF
28.5	24.0	2[illegible].0	29.0	10.0	28.0	1125	1200

SEDIMENTS: HARD SAND WITH SOME MUD

SPECIES	REPLICATES									
	1		2		3		4		5	
	ADLT	YNG	ADLT	YNG	ADLT	YNG	ADLT	YNG	ADLT	YNG
1 MAGELONA SP	256		128	48	96		224	128	256	144
2 CEREBRATULUS LACTEUS		16		64				160		128
3 COSSURA DELTA	32		16		16	16	144	16	64	
4 PINNIXA CRISTATA			112	96				80		
5 DIOPATRA CUPREA	48	48	96					16	16	32
6 PRICNOSPIO PINNATA	64	16		16				112	32	16
7 LUMBRINERIS TENUIS		64		16		80				64
8 NEREIS SP		80	16			16	32		64	
9 ANCISTROSYLLIS JCNESI	16	48	64				16		32	
10 MEDIOMASTUS CALIFORNIENSIS	16		48				48		64	
11 OWENIA FUSIFORMIS	16		16	48						96
12 LEPIDASTHENIA SP			112				16		16	16
13 NEREIS SUCCINEA							48		16	96
14 SIGAMBRA WASSI	16		48	16					32	
15 CLYMENELLA ZONALIS		32	16			16			16	16
16 THALASSEMA HARTMANI			96							
17 GLYCINDE SOLITARIA	16		16			16			16	
18 HEMIPHOLIS ELONGATA			32	16	16					
19 PINNIXA LUNZI			48	16						
20 NINOE NIGRIPES	16		16							16
21 NEMERTEA (YELLOW & PURPLE)				16			16		16	
22 PARAMYA SUBOVATA			32	16						
23 CORBULA DIETZIANA			32	16						
24 ASYCHIS ELONGATA									48	
25 NUCULANA CONCENTRICA	16	16								
26 EDWARDSIA SP		32								
27 SIGAMBRA TENTACULATA			16	16						
28 STHENELAIS BOA			32							
29 MAGELONA RIOJAI			16				16			
30 AMPELISCA ABDITA							16		16	
31 NEMERTEA (YELLOW BANDED)							16			16
32 TEREBRA PROTEXTA									16	16
33 ANADARA TRANSVERSA								16		
34 NEMERTEA (BROWN BAND)	16									
35 ABRA AEQUALIS				16						
36 LUNARCA OVALIS			16							
37 NEMERTEA (YELLOW BANDED)								16		
38 PHORONIS ARCHITECTA							16			
39 PSEUDOPOLYDORA SP										16
40 MICROPHOLIS ATRA									16	
41 MAGELONA ROSEA									16	
42 PARANTHUS RAPIFORMIS										16
TOTAL NUMBER OF INDIVIDUALS	528	352	1024	416	128	144	608	544	752	688

TABLE E37
EXPERIMENTAL STUDY BENTHIC DATA: IMMEDIATE POST-DISPOSAL PHASE SAMPLES.
NUMBER OF INDIVIDUALS/SQ.M. OF EACH SPECIES COLLECTED AT STATION 14-1 ON 15 SEP 75

SURF TEMP	SURF SAL	BOT TEMP	BOT SAL	DEPTH	SED TEMP	TIME ON	TIME OFF
28.0	22.0	28.0	28.0	14.5	28.0	830	1000

SEDIMENTS: GRAY CLAY AND MUD WITH SOME SHELL

SPECIES	REPLICATES									
	1		2		3		4		5	
	ADLT	YNG	ADLT	YNG	ADLT	YNG	ADLT	YNG	ADLT	YNG
1 REPLICATES NOT ANALYZED			****	****			****	****		
2 MAGELONA SP	64	240			48	176			384	368
3 MEDIOMASTUS CALIFORNIENSIS	80				64				112	
4 CEREBRATULUS LACTEUS		48				32				112
5 DIOPATRA CUPREA	32				80				80	
6 LUMBRINERIS TENUIS		64			16	16			32	48
7 NUCULANA CONCENTRICA	16	48			16					80
8 NEREIS SP		16				16				64
9 COSSURA DELTA		16				16				48
10 NINOE NIGRIPES		16			32				16	16
11 VITRINELLA HELICOIDEA	48				16				16	
12 ANADARA TRANSVERSA									16	48
13 AMPELISCA ABDITA		16				16				16
14 NEMERTEA (YELLOW BANDED)	16								32	
15 SCHISTOMERINGOS RUDOLPHI									16	16
16 SIGAMBRA WASSI		16								16
17 GLYCINDE SOLITARIA						16				16
18 ANCISTROSYLLIS JONESI									16	16
19 SIGAMBRA TENTACULATA									16	16
20 AUTOMATE EVERMANNI					16					
21 CERATOCEPHALE SP.	16									
22 PRIONOSPIO PINNATA										16
23 TEREBRA PROTEXTA		16								
24 SPIOCARCINUS LOBATUS		16								
25 GLYCERA AMERICANA					16					
26 BALANOGLOSSUS					16					
27 HEMIPHOLIS ELONGATA					16					
28 OWENIA FUSIFORMIS						16				
29 PINNIXA CRISTATA						16				
30 AMPHARETE (EYES)					16					
31 PALEONOTUS HETEROSETA					16					
32 ABRA AEQUALIS									16	
33 PHORONIS ARCHITECTA									16	
34 MICROPHOLIS ATRA										16
35 SPIOCHAETOPTERUS OCULATUS										16
36 MARPHYSA SANGUINEA									16	
37 PRIONOSPIO CIRRIFERA										16
38 ARICIDEA SP										16
39 GYPTIS VITTATA										16
TOTAL NUMBER OF INDIVIDUALS	272	512			368	320			784	976

TABLE E38
EXPERIMENTAL STUDY BENTHIC DATA: IMMEDIATE POST-DISPOSAL PHASE SAMPLES.
NUMBER OF INDIVIDUALS/SQ.M. OF EACH SPECIES COLLECTED AT STATION 14-2 ON 15 SEP 75

SURF TEMP	SURF SAL	BOT TEMP	BOT SAL	DEPTH	SED TEMP	TIME ON	TIME OFF
28.0	28.0	28.0	28.0	14.5	28.0	1015	1300

SEDIMENTS: SANDY CLAY WITH SHELL

SPECIES	REPLICATES									
	1		2		3		4		5	
	ADLT	YNG	ADLT	YNG	ADLT	YNG	ADLT	YNG	ADLT	YNG
1 REPLICATES NOT ANALYZED			****	****			****	****		
2 CEREBRATULUS LACTEUS		48				192				
3 LUMBRINERIS TENUIS	16	112				96				
4 DIOPATRA CUPREA	80	16			80				32	
5 MAGELONA SP	32					96				64
6 NUCULANA CONCENTRICA					16	112				
7 AMPELISCA ABDITA	16					96				
8 NINOE NIGRIPES		32				32			16	16
9 NEREIS SP						48				
10 SIGAMBRA TENTACULATA						16			32	
11 BUNODACTIS TEXENSIS						48				
12 VITRINELLA HELICOIDEA					48					
13 ABRA AEQUALIS						32				
14 MEDIOMASTUS CALIFORNIENSIS					32					
15 MAGELONA ROSEA					16	16				
16 TELLINA IRIS						32				
17 NEREIS SUCCINEA		16								
18 ARMANDIA AGILIS	16									
19 PORTUNIDAE		16								
20 CLYMENELLA ZONALIS						16				
21 NEMERTEA (YELLOW BANDED)					16					
22 OWENIA FUSIFORMIS						16				
23 POLYODONTES LUPINA					16					
24 GONEPLACIDAE						16				
25 XANTHIDAE						16				
26 NEMATODA					16					
27 ELECTRA CRUSTULENTA (COL)					16					
28 TURBONILLA INTERRUPTA						16				
29 ANTICLIMAX PILSBRYI					16					
TOTAL NUMBER OF INDIVIDUALS	160	240			272	896			80	80

TABLE E39
EXPERIMENTAL STUDY BENTHIC DATA: IMMEDIATE POST-DISPOSAL PHASE SAMPLES.
NUMBER OF INDIVIDUALS/SQ.M. OF EACH SPECIES COLLECTED AT STATION 14-3 ON 15 SEP 75

SURF TEMP	SURF SAL	BOT TEMP	BOT SAL	DEPTH	SED TEMP	TIME ON	TIME OFF
28.0	24.0	28.0	30.0	14.5	28.0	1315	1410

SEDIMENTS: SANDY GRAY CLAY WITH SHELL HASH

SPECIES	REPLICATES									
	1		2		3		4		5	
	ADLT	YNG	ADLT	YNG	ADLT	YNG	ADLT	YNG	ADLT	YNG
1 REPLICATES NOT ANALYZED			****	****			****	****		
2 CEREBRATULUS LACTEUS		16				16				32
3 MAGELONA SP	48									16
4 NINOE NIGRIPES	16					16				
5 MICROPHOLIS ATRA										32
6 SIGAMBRA WASSI									16	16
7 PETRICOLA PHOLADIFORMIS		16								
8 LUMBRINERIS TENUIS						16				
9 MEDIOMASTUS CALIFORNIENSIS					16					
10 PRIONOSPIO PINNATA						16				
11 CANTHARUS CANCELLARIUS						16				
12 ABRA AEQUALIS										16
13 COSSURA DELTA										16
14 GIANT SPERM									16	
TOTAL NUMBER OF INDIVIDUALS	64	32			16	80			32	128

TABLE E40
EXPERIMENTAL STUDY BENTHIC DATA: IMMEDIATE POST-DISPOSAL PHASE SAMPLES.
NUMBER OF INDIVIDUALS/SQ.M. OF EACH SPECIES COLLECTED AT STATION 14-4 ON 15 SEP 75

SURF TEMP	SURF SAL	BOT TEMP	BOT SAL	DEPTH	SED TEMP	TIME ON	TIME OFF
28.0	25.0	28.0	28.0	14.5	28.0	1420	1520

SEDIMENTS: GRAY CLAY AND SAND

SPECIES	REPLICATES									
	1		2		3		4		5	
	ADLT	YNG	ADLT	YNG	ADLT	YNG	ADLT	YNG	ADLT	YNG
1 REPLICATES NOT ANALYZED			****	****			****	****		
2 CLYTIA CORONATA (COLONIES)					128				16	
3 MAGELCNA SP	16								16	
4 CEREBRATULUS LACTEUS						32				
5 DIOPATRA CUPREA					16				16	
6 PHORONIS ARCHITECTA					16				16	
7 MEDIOMASTUS CALIFORNIENSIS	16									
8 PINNIXA CRISTATA	16									
9 BALANOGLOSSUS					16					
10 LEPIDASTHENIA SP						16				
11 VITRINELLA HELICOIDEA					16					
12 NEMERTEA (YELLOW BANDED)						16				
TOTAL NUMBER OF INDIVIDUALS	48				192	64			64	

TABLE E41
EXPERIMENTAL STUDY BENTHIC DATA: IMMEDIATE POST-DISPOSAL PHASE SAMPLES.
NUMBER OF INDIVIDUALS/SQ.M. OF EACH SPECIES COLLECTED AT STATION 14-5 ON 15 SEP 75

SURF TEMP	SURF SAL	BOT TEMP	BOT SAL	DEPTH	SED TEMP	TIME ON	TIME OFF
28.5	24.5	28.0	29.0	14.5	28.0	1530	1600

SEDIMENTS: SOME SANDY SHELL, GRAY CLAY

SPECIES	REPLICATES									
	1		2		3		4		5	
	ADLT	YNG	ADLT	YNG	ADLT	YNG	ADLT	YNG	ADLT	YNG
1 REPLICATES NOT ANALYZED			****	****			****	****		
2 BALANOGLOSSUS	32				224					
3 MAGELONA SP					96	48				
4 CEREBRATULUS LACTEUS		16				96				
5 LUMBRINERIS TENUIS					32	80				
6 ANCISTROSYLLIS JONESI					32				48	
7 NUCULANA CONCENTRICA					32	48				
8 DIOPATRA CUPREA	16				32				16	
9 NINOE NIGRIPES		16			48					
10 LEPIDASTHENIA SP					32	32				
11 SIGAMBRA TENTACULATA						48				16
12 CLYTIA CORONATA (COLONIES)					64					
13 PINNIXA CRISTATA						48				
14 AMPELISCA ABDITA					32					
15 MEDIOMASTUS CALIFORNIENSIS					32					
16 OWENIA FUSIFORMIS						32				
17 COSSURA DELTA	16									
18 ABRA AEQUALIS						16				
19 ANADARA TRANSVERSA						16				
20 GLYCINDE SOLITARIA					16					
21 NATICA PUSILLA					16					
22 NEREIS SP					16					
23 PSEUDEURYTHOE AMBIGUA						16				
24 VOLVULELLA TEXASIANA					16					
25 MAGELONA RIOJAI					16					
26 SPIOCARCINUS LOBATUS						16				
27 ARICIDEA SP						16				
28 MAGELONA ROSEA					16					
29 TELLINA VERSICOLOR						16				
TOTAL NUMBER OF INDIVIDUALS	64	32			752	528			64	16

TABLE E42
EXPERIMENTAL STUDY BENTHIC DATA: IMMECIATE POST-DISPOSAL PHASE SAMPLES.
NUMBER OF INDIVIDUALS/SQ.M. OF EACH SPECIES COLLECTED AT STATION 12-1 ON 16 SEP 75

SURF TEMP	SURF SAL	BOT TEMP	BOT SAL	DEPTH	SED TEMP	TIME ON	TIME OFF
28.0	24.0	28.5	28.0	14.0	28.0	1115	1220

SEDIMENTS: GRAY SANDY CLAY WITH LITTLE SHELL. NO EVIDENCE OF SPOIL

SPECIES	REPLICATES									
	1		2		3		4		5	
	ADLT	YNG	ADLT	YNG	ADLT	YNG	ADLT	YNG	ADLT	YNG
1 REPLICATES NOT ANALYZED			****	****			****	****		
2 MAGELONA SP	80	176							32	
3 LUMBRINERIS TENUIS	16	48								
4 DIOPATRA CUPREA	32					16				
5 NEREIS SP		48								
6 AMPELISCA ABDITA		32								
7 MEDIOMASTUS CALIFORNIENSIS		32								
8 SPIOCHAETOPTERUS OCULATUS		16							16	
9 ANCISTROSYLLIS JONESI	16									
10 COSSURA DELTA		16								
11 PRIONOSPIO PINNATA		16								
12 SIGAMBRA WASSI	16									
13 MAGELONA ROSEA	16									
14 ARMANDIA AGILIS		16								
15 NUCULANA CONCENTRICA						16				
16 NINOE NIGRIPES									16	
TOTAL NUMBER OF INDIVIDUALS	176	400				32			64	

TABLE E43
EXPERIMENTAL STUDY BENTHIC DATA: IMMEDIATE POST-DISPOSAL PHASE SAMPLES.
NUMBER OF INDIVIDUALS/SQ.M. OF EACH SPECIES COLLECTED AT STATION 12-2 ON 16 SEP 75

SURF TEMP	SURF SAL	BOT TEMP	BOT SAL	DEPTH	SED TEMP	TIME ON	TIME OFF
28.5	28.0	29.0	31.0	14.0	28.0	1240	1400

SEDIMENTS: GRAY SANDY CLAY WITH SOME SHELL. NO EVIDENCE OF SPOIL

SPECIES	REPLICATES									
	1		2		3		4		5	
	ADLT	YNG	ADLT	YNG	ADLT	YNG	ADLT	YNG	ADLT	YNG
1 REPLICATES NOT ANALYZED			****	****			****	****		
2 MAGELONA SP	96	288			208	192				400
3 PARAMYA SUBOVATA									96	128
4 CEREBRATULUS LACTEUS		64				96				48
5 DIOPATRA CUPREA	32				32				80	48
6 LUMBRINERIS TENUIS						80				112
7 NINOE NIGRIPES	64	48			16	16			16	16
8 PHORONIS ARCHITECTA	48				64					
9 HEMIPHOLIS ELONGATA						32			48	32
10 NUCULANA CONCENTRICA					16					64
11 OWENIA FUSIFORMIS										80
12 NEREIS SP						64				
13 PRIONOSPIO PINNATA						48				16
14 ANCISTROSYLLIS JONESI	16				16					16
15 COSSURA DELTA		32								16
16 MEDIOMASTUS CALIFORNIENSIS	16				32					
17 NEREIS SUCCINEA	16					32				
18 GIANT SPERM						16			16	16
19 LEPIDASTHENIA SP	16								16	
20 SIGAMBRA TENTACULATA		16				16				
21 SIGAMBRA WASSI	16					16				
22 VITRINELLA HELICOIDEA	32									
23 NEMERTEA (YELLOW BANDED)					32					
24 AMPELISCA ABDITA										32
25 TEREBRA PROTEXTA		16								
26 ARICIDEA SP	16									
27 SPIOCARCINUS LOBATUS	16									
28 AGLAOPHAMUS VERRILLI						16				
29 CLYMENELLA ZONALIS						16				
30 GLYCINDE SOLITARIA						16				
31 MICROPHOLIS ATRA					16					
32 STHENELAIS BOA					16					
33 AMPHARETE (EYES)						16				
34 TELLINA IRIS						16				
35 ANADARA TRANSVERSA										16
36 NEPHTYS PICTA									16	
37 BUSYCON CONTRARIUM									16	
38 PAGURUS ANNULIPES									16	
39 GYPTIS VITTATA										16
40 AUTOMATE EVERMANNI									16	
TOTAL NUMBER OF INDIVIDUALS	384	464			448	688			336	1056

TABLE E44
EXPERIMENTAL STUDY BENTHIC DATA: IMMECIATE POST-DISPOSAL PHASE SAMPLES.
NUMBER OF INDIVIDUALS/SQ.M. OF FACH SPECIES COLLECTED AT STATION 12-3 ON 16 SFP 75

SURF TEMP	SURF SAL	BOT TEMP	BOT SAL	DEPTH	SED TEMP	TIME ON	TIME OFF
27.5	22.0	28.0	27.5	14.0	28.0	830	930

SEDIMENTS: SHELL & SAND. THICK LUMPS CF GRAY CLAY

SPECIES	REPLICATES									
	1		2		3		4		5	
	ADLT	YNG	ADLT	YNG	ADLT	YNG	ADLT	YNG	ADLT	YNG
1 REPLICATES NOT ANALYZEC			****	****			****	****		
2 CAECUM GLABRUM	144				16				16	
3 MAGELONA SP	16	48							32	16
4 MEDIOMASTUS CALIFORNIENSIS	48								32	
5 LUMBRINERIS TENUIS						16				48
6 PRIONOSPIO PINNATA	16									32
7 ANADARA TRANSVERSA		32				16				
8 NEREIS SP						16				32
9 ELECTRA SP (COLONIES)	32									
10 PSEUDEURYTHOE AMBIGUA		16				16				
11 DIOPATRA CUPREA		16							16	
12 AGRIPOMA TEXASIANA						32				
13 NEMERTEA (YELLOW BANDED)										32
14 GLYCERA AMERICANA										16
15 TYPOSYLLIS CORALLICOLCICES		16								
16 PHORONIS ARCHITECTA	16									
17 CIRRATULUS HEDGPETHI	16									
18 GYPTIS VITTATA						16				
19 BOWMANIELLA BRASILIENSIS						16				
20 PSEUDOPOLYDORA SP						16				
21 ABRA AEQUALIS										16
22 CLYMENELLA TORQUATA CALIDA										16
23 PETRICOLA PHOLADIFORMIS										16
TOTAL NUMBER OF INDIVIDUALS	288	128			16	144			96	224

TABLE E45
EXPERIMENTAL STUDY BENTHIC DATA: IMMEDIATE POST-DISPOSAL PHASE SAMPLES.
NUMBER OF INDIVIDUALS/SQ.M. OF EACH SPECIES COLLECTED AT STATION 12-4 ON 16 SEP 75

SURF TEMP	SURF SAL	BOT TEMP	BOT SAL	DEPTH	SED TEMP	TIME ON	TIME OFF
28.0	24.0	28.5	30.0	14.0	28.5	950	1100

SEDIMENTS: GRAY SANDY CLAY WITH LITTLE SHELL. NO EVIDENCE OF SPOIL

SPECIES	REPLICATES									
	1		2		3		4		5	
	ADLT	YNG	ADLT	YNG	ADLT	YNG	ADLT	YNG	ADLT	YNG
1 REPLICATES NOT ANALYZED			****	****			****	****		
2 MAGELONA SP		304			16	160				16
3 DIOPATRA CUPREA		16			32				80	
4 SIGAMBRA WASSI	48	16			48					
5 CEREBRATULUS LACTEUS		96								
6 LUMBRINERIS TENUIS		64				32				
7 NINCE NIGRIPES	32	16			16	16				
8 ANCISTROSYLLIS JONESI		32				16			16	
9 COSSURA DELTA		16				32				
10 NEREIS SP		16				32				
11 VITRINELLA HELICOIDEA	32								16	
12 ABRA AEQUALIS	16	16								
13 PRIONOSPIO PINNATA		16								16
14 GLYCINDE SOLITARIA		16								
15 VARICORBULA OPERCULATA	16									
16 ASYCHIS ELONGATA		16								
17 TELLINA IRIS		16								
18 MICROPHOLIS ATRA		16								
19 NEMERTEA (YELLOW & PURPLE)						16				
20 NEMERTEA (YELLOW BANDED)					16					
21 ANEMONE UN ID						16				
TOTAL NUMBER OF INDIVIDUALS	144	672			128	320			112	32

TABLE E46
EXPERIMENTAL STUDY BENTHIC DATA: IMMEDIATE POST-DISPOSAL PHASE SAMPLES.
NUMBER OF INDIVIDUALS/SQ.M. OF EACH SPECIES COLLECTED AT STATION 12-5 ON 27 SEP 75

SURF TEMP	SURF SAL	BOT TEMP	BOT SAL	DEPTH	SED TEMP	TIME ON	TIME OFF
26.0	27.0	26.0	25.0	14.0		1145	1230

SEDIMENTS: MUDDY SAND. EVIDENCE OF SPOIL DISPOSAL

SPECIES	REPLICATES									
	1		2		3		4		5	
	ADLT	YNG	ADLT	YNG	ADLT	YNG	ADLT	YNG	ADLT	YNG
1 REPLICATES NOT ANALYZED			****	****			****	****		
2 MAGELONA SP	640	320			48	80				32
3 NEREIS SP	32	224				16				48
4 LUMBRINERIS TENUIS		160				32				
5 NUCULANA CONCENTRICA		160								16
6 CEREBRATULUS LACTEUS		144								16
7 SIGAMBRA WASSI	96	64								
8 PRIONOSPIO PINNATA		128								16
9 TELLINA IRIS		80								16
10 COSSURA DELTA		64								16
11 DIOPATRA CUPREA	48	16							16	
12 OWENIA FUSIFORMIS	16	64								
13 PHORONIS ARCHITECTA	64				16					
14 ANCISTROSYLLIS JONESI	48	16								
15 OXYUROSTYLIS SALINOI	64									
16 ARMANDIA AGILIS	64									
17 NINOE NIGRIPES	16	16			16					
18 NUCULANA ACUTA		48								
19 SPIOCHAETOPTERUS OCULATUS	32	16								
20 ALPHEUS FLORIDANUS		32								
21 NEMERTEA (YELLOW BANDED)	16								16	
22 NOTOMASTUS LATERICEUS		16				16				
23 CORBULA BARRATTANIA	32									
24 NEPHTYS PICTA	16	16								
25 MEDIOMASTUS CALIFORNIENSIS									16	
26 ANACHIS OBESA		16								
27 CLYMENELLA ZONALIS		16								
28 GLYCERA AMERICANA	16									
29 PINNIXA CRISTATA		16								
30 DENTALIUM TEXASIANUM	16									
31 VOLVULELLA TEXASIANA	16									
32 MAGELONA ROSEA	16									
33 CLYMENELLA TORQUATA CALIDA		16								
34 ANTICLIMAX PILSBRYI	16									
35 TEREBELLIDAE SP A	16									
36 HEMIPHOLIS ELONGATA					16					
37 PHASCOLION STROMBI					16					
38 MICROPHOLIS ATRA					16					
39 VARICORBULA OPERCULATA					16					
40 LEPIDONOTUS SUBLEVIS					16					
TOTAL NUMBER OF INDIVIDUALS	1280	1648			160	144			48	160

TABLE E47
EXPERIMENTAL STUDY BENTHIC DATA: IMMEDIATE POST-DISPOSAL PHASE SAMPLES.
NUMBER OF INDIVIDUALS/SQ.M. OF EACH SPECIES COLLECTED AT STATION 27-1 ON 17 SEP 75

SURF TEMP	SURF SAL	BOT TEMP	BOT SAL	DEPTH	SED TEMP	TIME ON	TIME OFF
28.0	26.5	28.0	30.0	14.0	28.0	1230	1350

SEDIMENTS: MUDDY SAND

SPECIES	REPLICATES									
	1		2		3		4		5	
	ADLT	YNG	ADLT	YNG	ADLT	YNG	ADLT	YNG	ADLT	YNG
1 REPLICATES NOT ANALYZED			****	****			****	****		
2 DIOPATRA CUPREA					16	48				
3 ANCISTROSYLLIS JONESI		16							16	
4 SIGAMBRA WASSI	16				16					
5 VITRINELLA HELICOIDEA					16				16	
6 COSSURA DELTA	16									
7 MAGELONA SP					16					
8 NUCULANA CONCENTRICA						16				
9 CEREBRATULUS LACTEUS										16
TOTAL NUMBER OF INDIVIDUALS	32	16			64	64			32	16

TABLE E48
EXPERIMENTAL STUDY BENTHIC DATA: IMMECIATE POST-DISPOSAL PHASE SAMPLES.
NUMBER OF INDIVIDUALS/SQ.M. OF EACH SPECIES COLLECTED AT STATION 27-2 ON 17 SEP 75

SURF TEMP	SURF SAL	BOT TEMP	BOT SAL	DEPTH	SED TEMP	TIME ON	TIME OFF
28.0	26.0	28.0	32.C	14.0	28.0	1400	1420

SEDIMENTS: MUDDY SAND VERY LOOSE

SPECIES	REPLICATES									
	1		2		3		4		5	
	ADLT	YNG	ADLT	YNG	ADLT	YNG	ADLT	YNG	ADLT	YNG
1 REPLICATES NOT ANALYZED			****	****			****	****		
2 SIGAMBRA WASSI	64								16	
3 VITRINELLA HELICOIDEA	64									
4 MAGELONA SP					16				48	
5 MEDICMASTUS CALIFORNIENSIS		32								
6 NUCULANA CONCENTRICA						32				
7 NASSARIUS ACUTUS		16								
8 NATICA PUSILLA		16								
9 PRIONOSPIO PINNATA	16									
10 MAGELCNA RIOJAI	16									
11 ANTICLIMAX PILSBRYI		16								
12 ANACHIS OBESA						16				
13 ANCISTROSYLLIS JONESI						16				
TOTAL NUMBER OF INDIVIDUALS	160	80			16	64			64	

TABLE E49
EXPERIMENTAL STUDY BENTHIC DATA: IMMEDIATE POST-DISPOSAL PHASE SAMPLES.
NUMBER OF INDIVIDUALS/SQ.M. OF EACH SPECIES COLLECTED AT STATION 27-3 ON 17 SEP 75

SURF TEMP	SURF SAL	BOT TEMP	BOT SAL	DEPTH	SED TEMP	TIME ON	TIME OFF
28.0	29.0	28.0	32.0	14.0	28.0	1430	1500

SEDIMENTS: MUDDY SAND, VERY LOOSE.

SPECIES	REPLICATES 1		2		3		4		5	
	ADLT	YNG	ADLT	YNG	ADLT	YNG	ADLT	YNG	ADLT	YNG
1 REPLICATES NOT ANALYZED			****	****			****	****		
2 MAGELONA SP						272				
3 ANCISTROSYLLIS JONESI		128								
4 CEREBRATULUS LACTEUS		32			16					48
5 DIOPATRA CUPREA	16				48					
6 LUMBRINERIS TENUIS						32			16	
7 NUCULANA CONCENTRICA									16	16
8 ALPHEUS FLORIDANUS										16
9 ABRA AEQUALIS		16								
10 AMPELISCA ABDITA						16				
11 BALANOGLOSSUS					16					
12 NEREIS SUCCINEA						16				
13 NEREIS SP						16				
14 OWENIA FUSIFORMIS						16				
15 PINNIXA CRISTATA						16				
16 PSEUDEURYTHOE AMBIGUA						16				
17 SIGAMBRA WASSI						16				
18 MEDIOMASTUS CALIFORNIENSIS									16	
19 POLYCDONTES LUPINA									16	
20 SINUM MACULATUM										16
21 VOLVULELLA TEXASIANA									16	
22 CALLIANASSA SP										16
TOTAL NUMBER OF INDIVIDUALS	16	176			80	416			80	112

TABLE E50
EXPERIMENTAL STUDY BENTHIC DATA: IMMEDIATE POST-DISPOSAL PHASE SAMPLES.
NUMBER OF INDIVIDUALS/SQ.M. OF EACH SPECIES COLLECTED AT STATION 27-4 ON 17 SEP 75

SURF TEMP	SURF SAL	BOT TEMP	BOT SAL	DEPTH	SED TEMP	TIME ON	TIME OFF
28.5	28.0	28.0	30.0	14.0	28.0	1520	1600

SEDIMENTS: SANDY MUD, VERY SOFT

SPECIES	REPLICATES									
	1		2		3		4		5	
	ADLT	YNG	ADLT	YNG	ADLT	YNG	ADLT	YNG	ADLT	YNG
1 REPLICATES NOT ANALYZED			****	****			****	****		
2 DIOPATRA CUPREA									128	
3 NUCULANA CONCENTRICA						16			16	32
4 MAGELONA SP		16								32
5 SIGAMBRA WASSI									16	16
6 SIGAMBRA TENTACULATA						16				
7 VOLVULELLA TEXASIANA					16					
8 CEREBRATULUS LACTEUS										16
9 COSSURA DELTA										16
10 NASSARIUS ACUTUS										16
11 NEREIS SP									16	
12 VITRINELLA HELICOIDEA									16	
TOTAL NUMBER OF INDIVIDUALS		16			16	32			192	128

TABLE E51
EXPERIMENTAL STUDY BENTHIC DATA: IMMEDIATE POST-DISPOSAL PHASE SAMPLES.
NUMBER OF INDIVIDUALS/SQ.M. OF EACH SPECIES COLLECTED AT STATION 27-5 ON 17 SEP 75

SURF TEMP	SURF SAL	BOT TEMP	BOT SAL	DEPTH	SED TEMP	TIME ON	TIME OFF
28.0	27.5	28.0	32.0	14.0	28.0	1615	1635

SEDIMENTS: 1-2 MM OXIDIZED MUD OVER MUD, SAND & GRAY CLAY

SPECIES	REPLICATES									
	1		2		3		4		5	
	ADLT	YNG	ADLT	YNG	ADLT	YNG	ADLT	YNG	ADLT	YNG
1 REPLICATES NOT ANALYZED			****	****			****	****		
2 MAGELONA SP	128	128			16	32			128	32
3 NUCULANA CONCENTRICA	16	48							16	48
4 NASSARIUS ACUTUS		16			16					80
5 PRIONOSPIO PINNATA	16	80							16	
6 DIOPATRA CUPREA	80				16					
7 MEDIOMASTUS CALIFORNIENSIS	32	16							32	
8 NATICA PUSILLA	32	16			16					
9 SIGAMBRA WASSI	32								16	
10 LUMBRINERIS TENUIS		32								16
11 VOLVULELLA TEXASIANA	16				16				16	
12 VITRINELLA HELICOIDEA	32								16	
13 COSSURA DELTA									48	
14 AMPELISCA ABDITA		32								
15 ANACHIS OBESA		16				16				
16 LEPIDASTHENIA SP		16				16				
17 NEREIS SP		16							16	
18 PHASCOLION STROMBI		32								
19 CEREBRATULUS LACTEUS						32				
20 HEMIPHOLIS ELONGATA									16	16
21 TEREBRA PROTEXTA									16	
22 ABRA AEQUALIS		16								
23 NINOE NIGRIPES		16								
24 PINNIXA CRISTATA		16								
25 PAGURUS ANNULIPES		16								
26 MAGELONA ROSEA		16								
27 NEPHTYS INCISA		16								
28 SIGAMBRA TENTACULATA						16				
29 CYCLOSTREMISCUS SUPPRESSUS					16					
30 DRILONEREIS LONGA						16				
31 NEMERTEA (YELLOW BANDED)										16
TOTAL NUMBER OF INDIVIDUALS	384	544			96	128			336	208

TABLE E52
EXPERIMENTAL STUDY BENTHIC DATA: POST-DISPOSAL PHASE SAMPLES.
NUMBER OF INDIVIDUALS/SQ.M. OF EACH SPECIES COLLECTED AT STATION 2-1 ON 23 NOV 75

SURF TEMP	SURF SAL	BOT TEMP	BOT SAL	DEPTH	SED TEMP	TIME ON	TIME OFF
16.0	24.0	17.5	25.5	10.0	19.5	1435	1505

SEDIMENTS: 2 MM OXIDIZED MUD OVER SAND & SHELL HASH.

SPECIES	REPLICATES									
	1		2		3		4		5	
	ADLT	YNG	ADLT	YNG	ADLT	YNG	ADLT	YNG	ADLT	YNG
1 MAGELONA SP	480		800	16	464		384		144	
2 MEDIOMASTUS CALIFORNIENSIS	368		752		496	16	448		160	
3 NEREIS SUCCINEA	160		160	16	128		32		64	
4 ANADARA TRANSVERSA		16				160		80		
5 NEREIS SP	80		48		32		16		80	
6 PRIONOSPIO PINNATA	16	16	16	16	112	16		16	16	
7 PSEUDEURYTHOE AMBIGUA			48	64			32		16	
8 SPIOCHAETOPTERUS OCULATUS	32		16		32				64	
9 NEMERTEA (YELLOW BANDED)			16	32		16		32		
10 DIOPATRA CUPREA					48	16	16		16	
11 OWENIA FUSIFORMIS	16			32	16				16	
12 CEREBRATULUS LACTEUS				32		16		16		16
13 PINNIXA CRISTATA		48								32
14 BUNODACTIS TEXENSIS	16				16		16		16	
15 HEMIPHOLIS ELONGATA			16		32			16		
16 LUMBRINERIS TENUIS				16		16		16		
17 COROPHIUM ACHERUSICUM					48					
18 NEMERTEA (YELLOW & PURPLE)				16				16		
19 ELECTRA SP (COLONIES)			16				16			
20 SIGAMBRA TENTACULATA						32				
21 BATEA CARTHARINENSIS	16								16	
22 NATICA PUSILLA	16									
23 ALBUNEA PARETII		16								
24 CIRRATULUS HEDGPETHI	16									
25 PRIONOSPIO CIRRIFERA	16									
26 ABRA AEQUALIS				16						
27 LEPIDASTHENIA SP				16						
28 NUCULANA CONCENTRICA						16				
29 STHENELAIS BOA					16					
30 NOTOMASTUS LATERICEUS							16			
31 NEMERTEA (WHITE)								16		
32 SPIOPHANES BOMBYX							16			
33 POLINICES DUPLICATUS								16		
34 MALACOCEROS SP									16	
35 TELLINA ALTERNATA										16
36 EPITONIUM ANGULATUM										16
37 ARMANDIA AGILIS									16	
38 SCOLOPLOS (LEODAMUS) RUBRA							16			
TOTAL NUMBER OF INDIVIDUALS	1232	96	1888	272	1440	304	1008	224	640	80

TABLE E53
EXPERIMENTAL STUDY BENTHIC DATA: POST-DISPOSAL PHASE SAMPLES.
NUMBER OF INDIVIDUALS/SQ.M. OF EACH SPECIES COLLECTED AT STATION 2-2 ON 25 NOV 75

SURF TEMP	SURF SAL	BOT TEMP	BOT SAL	DEPTH	SED TEMP	TIME ON	TIME OFF
18.0	26.0	20.0	30.0	10.5	21.0	917	1005

SEDIMENTS: GRAY CLAY WITH SAND AND SHELL.

SPECIES	REPLICATES									
	1		2		3		4		5	
	ADLT	YNG	ADLT	YNG	ADLT	YNG	ADLT	YNG	ADLT	YNG
1 REPLICATES NOT ANALYZED			****	****			****	****		
2 PRIONOSPIO PINNATA	528	576			560	544			224	128
3 MAGELONA SP	304				384	32			528	
4 MEDIOMASTUS CALIFORNIENSIS	16				224				768	32
5 LUMBRINERIS TENUIS		16				96			64	
6 ANCISTROSYLLIS JONESI	32				64	48			16	
7 NEREIS SUCCINEA	32				32				48	
8 CEREBRATULUS LACTEUS					32	64				16
9 NEMERTEA (YELLOW & PURPLE)		16				32				48
10 DIOPATRA CUPREA	16								64	
11 GLYCINDE SOLITARIA					32	16				16
12 NEMERTEA (YELLOW BANDED)						16				48
13 AMPELISCA ABDITA	32									16
14 CLYMENELLA ZONALIS	32					16				
15 PSEUDEURYTHOE AMBIGUA	16				32					
16 SIGAMBRA TENTACULATA					16	16			16	
17 AMPHARETE (EYES)					16				32	
18 LEPIDASTHENIA SP						32				
19 NEREIS SP					16				16	
20 PINNIXA CRISTATA					16	16				
21 ANACHIS OBESA									32	
22 NASSARIUS ACUTUS									32	
23 NUCULANA CONCENTRICA									32	
24 ABRA AEQUALIS		16								
25 ANADARA TRANSVERSA		16								
26 NEMERTEA (WHITE)		16								
27 MULINIA LATERALIS	16									
28 ELECTRA SP (COLONIES)	16									
29 SIGAMBRA WASSI						16				
30 THARYX SETIGERA					16					
31 PSEUDOPOLYDORA SP					16					
32 GLYCERA AMERICANA									16	
33 MAGELONA RIOJAI									16	
34 PRIONOSPIO CIRRIFERA									16	
35 COROPHIUM ACHERUSICUM									16	
36 PAGURUS ANNULIPES									16	
37 SPIONIDAE										16
TOTAL NUMBER OF INDIVIDUALS	1040	656			1456	944			1952	320

TABLE E54
EXPERIMENTAL STUDY BENTHIC DATA: POST-DISPOSAL PHASE SAMPLES.
NUMBER OF INDIVIDUALS/SQ.M. OF EACH SPECIES COLLECTED AT STATION 2-3 ON 25 NOV 75

SURF TEMP	SURF SAL	BOT TEMP	BOT SAL	DEPTH	SED TEMP	TIME ON	TIME OFF
18.0	25.0	20.0	28.0	11.0	21.0	817	900

SEDIMENTS: BLACK MUDDY SAND

SPECIES	REPLICATES									
	1		2		3		4		5	
	ADLT	YNG	ADLT	YNG	ADLT	YNG	ADLT	YNG	ADLT	YNG
1 REPLICATES NOT ANALYZED			****	****			****	****		
2 PRIONOSPIO PINNATA	640	560			16	48			144	256
3 MEDIOMASTUS CALIFORNIENSIS	240				176				80	
4 MAGELONA SP	192				16				160	
5 LUMBRINERIS TENUIS	16	32								144
6 CLYMENELLA ZONALIS	96								16	
7 NEREIS SP	16								80	16
8 CEREBRATULUS LACTEUS		16							16	48
9 PINNIXA CRISTATA	16	16								48
10 DIOPATRA CUPREA	16								48	
11 NUCULANA CONCENTRICA	48								16	
12 NEMERTEA (YELLOW & PURPLE)		48								
13 NEREIS SUCCINEA	16								32	
14 ELASMOPUS RAPAX	16								32	
15 PHORONIS ARCHITECTA									48	
16 AMPELISCA ABDITA	16								16	
17 COSSURA DELTA	32									
18 NEMERTEA (YELLOW BANDED)	16	16								
19 NEMERTEA (WHITE)	16	16								
20 OGYRIDES LIMICOLA	16	16								
21 ANADARA TRANSVERSA						16				16
22 NOTOMASTUS HEMIPODUS									32	
23 SPIOCHAETOPTERUS OCULATUS									32	
24 GLYCINDE SOLITARIA	16									
25 LEPIDASTHENIA SP		16								
26 NASSARIUS ACUTUS	16									
27 PHASCOLION STROMBI	16									
28 PINNIXA LUNZI		16								
29 MELINNA MACULATA	16									
30 AMPHARETE (EYES)	16									
31 NOTOMASTUS LATERICEUS						16				
32 COROPHIUM ACHERUSICUM						16				
33 CLYTIA CORONATA (COLONIES)					16					
34 ANCISTROSYLLIS JONESI									16	
35 HEMIPHOLIS ELONGATA									16	
36 SOLEN VIRIDIS									16	
TOTAL NUMBER OF INDIVIDUALS	1488	752			224	96			800	528

TABLE E55
EXPERIMENTAL STUDY BENTHIC DATA: POST-DISPOSAL PHASE SAMPLES.
NUMBER OF INDIVIDUALS/SQ.M. OF EACH SPECIES COLLECTED AT STATION 2-4 ON 25 NOV 75

SURF TEMP	SURF SAL	BOT TEMP	BOT SAL	DEPTH	SED TEMP	TIME ON	TIME OFF
18.0	28.0	18.0	30.0	11.0	20.5	1225	1305

SEDIMENTS: MUDDY SAND AND GRAY CLAY.

SPECIES	REPLICATES									
	1		2		3		4		5	
	ADLT	YNG	ADLT	YNG	ADLT	YNG	ADLT	YNG	ADLT	YNG
1 REPLICATES NOT ANALYZED			****	****			****	****		
2 MAGELONA SP	544								272	
3 CEREBRATULUS LACTEUS	16	368							96	288
4 PRIONOSPIO PINNATA	16	32			16	48			240	320
5 PINNIXA CRISTATA	16	144								48
6 MEDIOMASTUS CALIFORNIENSIS	96								48	
7 COSSURA DELTA	16				16				64	32
8 DIOPATRA CUPREA	80	16							32	
9 HEMIPHOLIS ELONGATA	112								16	
10 ANCISTROSYLLIS JONESI	16								64	32
11 LEPIDASTHENIA SP	16	32								64
12 LUMBRINERIS TENUIS		96								
13 AMPELISCA ABDITA	48								16	
14 NINOE NIGRIPES	16	16							32	
15 NEMERTEA (WHITE)		32							32	
16 BATEA CARTHARINENSIS									64	
17 NEREIS SP	32								16	
18 CIRRATULUS HEDGPETHI	16								32	
19 ANACHIS OBESA	32									
20 CLYMENELLA ZONALIS	16								16	
21 BALANOGLOSSUS									32	
22 NEMERTEA (YELLOW BANDED)		16								16
23 NEREIS SUCCINEA	16	16								
24 NUCULANA CONCENTRICA		16							16	
25 PHORONIS ARCHITECTA	32									
26 ARMANDIA AGILIS	32									
27 ELASMOPUS RAPAX									32	
28 SPIOCHAETOPTERUS OCULATUS									32	
29 VITRINELLA HELICOIDEA									32	
30 ABRA AEQUALIS		16								
31 NEMERTEA (YELLOW & PURPLE)		16								
32 OWENIA FUSIFORMIS	16									
33 PINNIXA LUNZI	16									
34 SIGAMBRA WASSI	16									
35 MAGELONA ROSEA	16									
36 COROPHIUM ACHERUSICUM	16									
37 AGLAOPHAMUS VERRILLI									16	
38 ANADARA TRANSVERSA										16
39 NATICA PUSILLA									16	
40 PSEUDEURYTHOE AMBIGUA									16	
41 ANCISTROSYLLIS HARTMANAE									16	
42 OXYUROSTYLIS SALINOI									16	
43 STYLOCHUS ELLIPTICUS									16	
44 GIANT SPERM									16	
TOTAL NUMBER OF INDIVIDUALS	1248	816			32	48			1296	816

TABLE E56
EXPERIMENTAL STUDY BENTHIC DATA: POST-DISPOSAL PHASE SAMPLES.
NUMBER OF INDIVIDUALS/SQ.M. OF EACH SPECIES COLLECTED AT STATION 2-5 ON 25 NOV 75

SURF TEMP	SURF SAL	BOT TEMP	BOT SAL	DEPTH	SED TEMP	TIME ON	TIME OFF
18.0	25.5	19.5	29.0	11.0	22.0	1140	1200

SEDIMENTS: MUDDY SAND WITH SHELLS.

SPECIES	REPLICATES									
	1		2		3		4		5	
	ADLT	YNG	ADLT	YNG	ADLT	YNG	ADLT	YNG	ADLT	YNG
1 REPLICATES NOT ANALYZED			****	****			****	****		
2 PRIONOSPIO PINNATA	224	256			112	288			320	352
3 MAGELONA SP	112				144				384	
4 MEDIOMASTUS CALIFORNIENSIS	80				192				144	
5 NEMERTEA (YELLOW BANDED)		32							16	48
6 LUMBRINERIS TENUIS		16				48				16
7 NEREIS SUCCINEA	16				32				32	
8 CIRRATULUS HEDGPETHI					32	32				
9 COSSURA DELTA	32								16	
10 NEREIS SP	16				16	16				
11 NUCULANA CONCENTRICA					32				16	
12 PINNIXA CRISTATA		16				16				
13 NEMERTEA (YELLOW & PURPLE)						32				
14 SIGAMBRA TENTACULATA					16					16
15 ANACHIS OBESA									32	
16 SPIOCHAETOPTERUS OCULATUS									32	
17 ANCISTROSYLLIS JONESI	16									
18 CEREBRATULUS LACTEUS					16					
19 NASSARIUS ACUTUS						16				
20 NATICA PUSILLA					16					
21 PAGURUS ANNULIPES					16					
22 MELINNA MACULATA									16	
TOTAL NUMBER OF INDIVIDUALS	496	320			624	448			1008	432

TABLE E57
EXPERIMENTAL STUDY BENTHIC DATA: POST-DISPOSAL PHASE SAMPLES.
NUMBER OF INDIVIDUALS/SQ.M. OF EACH SPECIES COLLECTED AT STATION 15-1 ON 4 DEC 75

SURF TEMP	SURF SAL	BOT TEMP	BOT SAL	DEPTH	SED TEMP	TIME ON	TIME OFF
16.0	27.0	16.0	29.0	8.0	17.0	1620	1640

SEDIMENTS: OXIDIZED SAND OVER GRAY CLAY.

SPECIES	REPLICATES									
	1		2		3		4		5	
	ADLT	YNG	ADLT	YNG	ADLT	YNG	ADLT	YNG	ADLT	YNG
1 REPLICATES NOT ANALYZED			****	****			****	****		
2 PRIONOSPIO PINNATA	80	304			272	256			560	512
3 MAGELONA SP	144				160	16			144	
4 MEDIOMASTUS CALIFORNIENSIS	112	16			192				64	16
5 SIGAMBRA WASSI	80	112			64					
6 SIGAMBRA TENTACULATA	16	48				16			64	48
7 VITRINELLA HELICOIDEA	128				16				16	
8 LUMBRINERIS TENUIS		80				64				
9 GLYCINDE SOLITARIA		32			32				16	
10 NUCULANA CONCENTRICA					48	16			16	
11 CEREBRATULUS LACTEUS		32				16				
12 DIOPATRA CUPREA	16					16			16	
13 NEREIS SUCCINEA	16	16			16					
14 PSEUDEURYTHOE AMBIGUA	16	16				16				
15 MULINIA LATERALIS		16								32
16 NATICA PUSILLA					48					
17 NASSARIUS ACUTUS					16				16	
18 ANCISTROSYLLIS JONESI	16									
19 GLYCERA AMERICANA	16									
20 PHASCOLION STROMBI	16									
21 PSEUDOPOLYDORA SP		16								
22 OGYRIDES LIMICOLA		16								
23 AMPELISCA ABDITA						16				
24 CLYMENELLA ZONALIS					16					
25 GYPTIS VITTATA						16				
26 NEMERTEA (YELLOW BANDED)						16				
27 ABRA AEQUALIS										16
28 ANADARA TRANSVERSA										16
29 COSSURA DELTA									16	
30 NEMERTEA (YELLOW & PURPLE)										16
31 COROPHIUM ACHERUSICUM									16	
32 AMPHARETE (EYES)									16	
33 NEREIS SP	16									
TOTAL NUMBER OF INDIVIDUALS	672	704			880	464			960	656

TABLE E58

EXPERIMENTAL STUDY BENTHIC DATA: POST-DISPOSAL PHASE SAMPLES.

NUMBER OF INDIVIDUALS/SQ.M. OF EACH SPECIES COLLECTED AT STATION 15-2 ON 4 DEC 75

SURF TEMP	SURF SAL	BOT TEMP	BOT SAL	DEPTH	SED TEMP	TIME ON	TIME OFF
16.5	29.0	17.0	30.5	8.0	17.0	1345	1415

SEDIMENTS: BLACK ORGANIC MUD.

SPECIES	REPLICATES									
	1		2		3		4		5	
	ADLT	YNG	ADLT	YNG	ADLT	YNG	ADLT	YNG	ADLT	YNG
1 REPLICATES NOT ANALYZED			****	****			****	****		
2 PRIONOSPIO PINNATA	208	240			320	480			128	192
3 MEDIOMASTUS CALIFORNIENSIS	608	48			384	48			272	
4 MAGELONA SP	208				288				160	
5 SIGAMBRA WASSI		96			16	32			16	80
6 SIGAMBRA TENTACULATA		64			48	64			32	16
7 SPIOCHAETOPTERUS OCULATUS	16				32				80	
8 NEMERTEA (YELLOW BANDED)		16				80				32
9 GLYCINDE SOLITARIA	16				64				32	
10 NEREIS SUCCINEA		16							96	
11 ANCISTROSYLLIS JONESI	64	16			16					
12 MULINIA LATERALIS		16			16	48				
13 CEREBRATULUS LACTEUS	32				16	16				
14 CLYMENELLA ZONALIS	32				16				16	
15 LUMBRINERIS TENUIS		48								16
16 NEREIS SP	16	32							16	
17 PSEUDEURYTHOE AMBIGUA						64				
18 DIOPATRA CUPREA									64	
19 NUCULANA CONCENTRICA					16	16				16
20 PSEUDOPOLYDORA SP						48				
21 OWENIA FUSIFORMIS						16			16	
22 NATICA PUSILLA						16				
23 ABRA AEQUALIS		16								
24 PINNIXA CRISTATA		16								
25 CIRRATULUS HEDGPETHI	16									
26 PAGURUS ANNULIPES	16									
27 LUNARCA OVALIS		16								
28 NASSARIUS ACUTUS					16					
29 GIANT SPERM					16					
30 NEMERTEA (YELLOW & PURPLE)										16
TOTAL NUMBER OF INDIVIDUALS	1232	640			1264	928			928	368

TABLE E59
EXPERIMENTAL STUDY BENTHIC DATA: POST-DISPOSAL PHASE SAMPLES.
NUMBER OF INDIVIDUALS/SQ.M. OF EACH SPECIES COLLECTED AT STATION 15-3 ON 4 DEC 75

SURF TEMP	SURF SAL	BOT TEMP	BOT SAL	DEPTH	SED TEMP	TIME ON	TIME OFF
16.5	28.5	17.0	31.5	8.0	17.0	1300	1335

SEDIMENTS: HARD SAND.

SPECIES	REPLICATES									
	1		2		3		4		5	
	ADLT	YNG	ADLT	YNG	ADLT	YNG	ADLT	YNG	ADLT	YNG
1 REPLICATES NOT ANALYZED			****	****			****	****		
2 PRIONOSPIO PINNATA	624	368			432	352			208	160
3 MEDIOMASTUS CALIFORNIENSIS	1104	48			592				288	
4 MAGELONA SP	32				80	16			240	48
5 CIRRATULUS HEDGPETHI	16				256	64				
6 SIGAMBRA TENTACULATA	32	64			64	32			16	32
7 PSEUDEURYTHOE AMBIGUA	48				32				80	32
8 NEREIS SUCCINEA	16				32	64			48	16
9 LUMBRINERIS TENUIS		64				16				64
10 DIOPATRA CUPREA	32				48				32	
11 SPIOCHAETOPTERUS OCULATUS	48								64	
12 CLYMENELLA ZONALIS	48								16	32
13 HEMIPHOLIS ELONGATA					48				32	
14 NEMERTEA (YELLOW BANDED)						64				
15 NEREIS SP					32				32	
16 GLYCINDE SOLITARIA	32					16				
17 NEMERTEA (YELLOW & PURPLE)		16				16				16
18 SIGAMBRA WASSI		32							16	
19 CEREBRATULUS LACTEUS						16				16
20 NUCULANA CONCENTRICA									16	16
21 LEPIDASTHENIA SP	16									
22 BUNODACTIS TEXENSIS	16									
23 ABRA AEQUALIS					16					
24 ANADARA TRANSVERSA					16					
25 HEXAPANOPEUS AUGUSTIFRONS					16					
26 PRIONOSPIO CIRRIFERA					16					
27 CLYTIA CORONATA (COLONIES)					16					
28 ANCISTROSYLLIS JONESI									16	
29 GLYCERA AMERICANA									16	
30 NASSARIUS ACUTUS									16	
31 MULINIA LATERALIS									16	
32 PAGURUS ANNULIPES									16	
33 MELINNA MACULATA									16	
34 BALANOGLOSSUS					16					
TOTAL NUMBER OF INDIVIDUALS	2064	592			1712	656			1184	432

TABLE E60
EXPERIMENTAL STUDY BENTHIC DATA: POST-DISPOSAL PHASE SAMPLES.
NUMBER OF INDIVIDUALS/SQ.M. OF EACH SPECIES COLLECTED AT STATION 15-4 ON 4 DEC 75

SURF TEMP	SURF SAL	BOT TEMP	BOT SAL	DEPTH	SED TEMP	TIME ON	TIME OFF
16.5	28.0	16.5	30.0	8.0	17.0	1500	1545

SEDIMENTS: SANDY MUD.

SPECIES	REPLICATES									
	1		2		3		4		5	
	ADLT	YNG	ADLT	YNG	ADLT	YNG	ADLT	YNG	ADLT	YNG
1 REPLICATES NOT ANALYZED			****	****			****	****		
2 MAGELONA SP	160	16			736				320	
3 PINNIXA CRISTATA		32				16			256	272
4 PSEUDEURYTHOE AMBIGUA					48	16			352	64
5 DIOPATRA CUPREA	16								400	
6 MEDIOMASTUS CALIFORNIENSIS	176				80				16	
7 PRIONOSPIO PINNATA	64	144			48	16				
8 PARAMYA SUBOVATA									256	
9 THALASSEMA HARTMANI									240	
10 PINNIXA LUNZI					16	16			144	32
11 HEMIPHOLIS ELONGATA									208	
12 NEREIS SP	64				48				64	
13 VITRINELLA HELICOIDEA	16				128					
14 PHORONIS ARCHITECTA					48				96	
15 LUMBRINERIS TENUIS						48				48
16 NOTOMASTUS LATERICEUS									64	
17 ANCISTROSYLLIS JONESI	16				16				32	
18 PSEUDOPOLYDORA SP									64	
19 NEREIS SUCCINEA	16				32					
20 SPIOCHAETOPTERUS OCULATUS	32								16	
21 LEPIDASTHENIA SP									48	
22 BATEA CARTHARINENSIS									32	
23 CEREBRATULUS LACTEUS	16								16	
24 CORBULA BARRATTANIA	16								16	
25 GLYCINDE SOLITARIA					32					
26 COROPHIUM ACHERUSICUM									32	
27 NEMERTEA (YELLOW BANDED)		16								
28 NUCULANA CONCENTRICA	16									
29 CLYTIA CORONATA (COLONIES)	16									
30 NEPHTYS MAGELLANICA	16									
31 PHASCOLION STROMBI	16									
32 PAGURUS ANNULIPES	16									
33 CIRRATULUS HEDGPETHI	16									
34 ARICIDEA SP					16					
35 NINOE NIGRIPES									16	
36 MAGELONA RIOJAI									16	
37 BRACHYURA									16	
TOTAL NUMBER OF INDIVIDUALS	688	208			1248	112			2720	416

TABLE E61
EXPERIMENTAL STUDY BENTHIC DATA: POST-DISPOSAL PHASE SAMPLES.
NUMBER OF INDIVIDUALS/SQ.M. OF EACH SPECIES COLLECTED AT STATION 15-5 ON 4 DEC 75

SURF TEMP	SURF SAL	BOT TEMP	BOT SAL	DEPTH	SED TEMP	TIME ON	TIME OFF
17.0	29.0	17.5	30.0	8.0	17.0	1430	1445

SEDIMENTS: SANDY GRAY CLAY.

SPECIES	REPLICATES									
	1		2		3		4		5	
	ADLT	YNG	ADLT	YNG	ADLT	YNG	ADLT	YNG	ADLT	YNG
1 REPLICATES NOT ANALYZED			****	****			****	****		
2 PRIONOSPIO PINNATA	160	48			176	544			128	240
3 PSEUDEURYTHOE AMBIGUA	80	32			416	400				16
4 MAGELONA SP	80	16			48	16			128	
5 BALANOGLOSSUS	48				224				16	
6 COSSURA DELTA	16				32	32			64	
7 PINNIXA CRISTATA		48				96				
8 LUMBRINERIS TENUIS	80					32				16
9 NEREIS SP	32				32				64	
10 NEMERTEA (YELLOW BANDED)	16				32	48				16
11 DIOPATRA CUPREA	32				32				32	
12 MEDIOMASTUS CALIFORNIENSIS	16				16	32			16	
13 CEREBRATULUS LACTEUS	16	16			16				16	
14 NEMERTEA (YELLOW & PURPLE)						32				32
15 NUCULANA CONCENTRICA					16	16			32	
16 MULINIA LATERALIS						64				
17 SPIOCHAETOPTERUS OCULATUS	32								16	
18 NINOE NIGRIPES	32									
19 SIGAMBRA WASSI	16	16								
20 CLYMENELLA ZONALIS						16			16	
21 LEPIDASTHENIA SP						32				
22 ANCISTROSYLLIS JONESI		16								
23 NATICA PUSILLA	16									
24 GYPTIS VITTATA					16					
25 AMPHARETE (EYES)					16					
26 SIGAMBRA TENTACULATA										16
27 TEREBRA PROTEXTA						16				
TOTAL NUMBER OF INDIVIDUALS	672	192			1072	1376			528	336

TABLE E62
EXPERIMENTAL STUDY BENTHIC DATA: POST-DISPOSAL PHASE SAMPLES.
NUMBER OF INDIVIDUALS/SQ.M. OF EACH SPECIES COLLECTED AT STATION 14-1 ON 24 NOV 75

SURF TEMP	SURF SAL	BOT TEMP	BOT SAL	DEPTH	SED TEMP	TIME ON	TIME OFF
17.0		21.0		16.0	21.0	1515	1605

SEDIMENTS: 1 MM OXIDIZED MUD OVER GRAY CLAY.

SPECIES	REPLICATES									
	1		2		3		4		5	
	ADLT	YNG	ADLT	YNG	ADLT	YNG	ADLT	YNG	ADLT	YNG
1 REPLICATES NOT ANALYZED			****	****			****	****		
2 MAGELONA SP	160				128				352	
3 CEREBRATULUS LACTEUS		48							16	320
4 AMPELISCA ABDITA	48	80			16				16	
5 DIOPATRA CUPREA	80				16				16	
6 LUMBRINERIS TENUIS	16	48			16	16				16
7 NUCULANA CONCENTRICA	32	32				32				16
8 MEDIOMASTUS CALIFORNIENSIS	16				16				48	
9 NINOE NIGRIPES	16	16			16					16
10 PINNIXA CRISTATA						16				48
11 NEREIS SP									64	
12 LEPIDASTHENIA SP									16	32
13 SIGAMBRA WASSI									32	16
14 SIGAMBRA TENTACULATA	16				16					
15 ELASMOPUS RAPAX	16	16								
16 ANEMONE (SAND ENCRUSTED)	16				16					
17 SPIOCARCINUS LOBATUS		16							16	
18 NEMERTEA (YELLOW BANDED)					16	16				
19 NEREIS SUCCINEA					32					
20 MAGELONA ROSEA									32	
21 ANCISTROSYLLIS JONESI	16									
22 PRIONOSPIO PINNATA						16				
23 NEMERTEA (WHITE)						16				
24 CIRRATULUS HEDGPETHI					16					
25 CERATOCEPHALE SP.					16					
26 CORBULA BARRATTANIA					16					
27 ELECTRA SP (COLONIES)					16					
28 LUNARCA OVALIS					16					
29 VOLVULELLA TEXASIANA					16					
30 ABRA AEQUALIS									16	
31 NOTOMASTUS LATERICEUS										16
32 PHORONIS ARCHITECTA									16	
TOTAL NUMBER OF INDIVIDUALS	432	256			384	112			640	480

TABLE E63
EXPERIMENTAL STUDY BENTHIC DATA: POST-DISPOSAL PHASE SAMPLES.
NUMBER OF INDIVIDUALS/SQ.M. OF EACH SPECIES COLLECTED AT STATION 14-2 ON 24 NOV 75

SURF TEMP	SURF SAL	BOT TEMP	BOT SAL	DEPTH	SED TEMP	TIME ON	TIME OFF
16.5		21.0		16.0	21.0	1630	1710

SEDIMENTS: 2 MM OXIDIZED SILT OVER SANDY GRAY CLAY.

SPECIES	REPLICATES									
	1		2		3		4		5	
	ADLT	YNG	ADLT	YNG	ADLT	YNG	ADLT	YNG	ADLT	YNG
1 REPLICATES NOT ANALYZED			****	****			****	****		
2 MAGELONA SP	288				464				144	
3 LUMBRINERIS TENUIS		224				80				64
4 PRIONOSPIO PINNATA		32			32	64				16
5 NUCULANA CONCENTRICA	16				32	16			32	16
6 CEREBRATULUS LACTEUS		32			16				16	32
7 NEMERTEA (YELLOW BANDED)		16			16	48				16
8 TELLINA VERSICOLOR	16	64								
9 COSSURA DELTA		48				16				
10 DIOPATRA CUPREA		16			16	16				16
11 MEDIOMASTUS CALIFORNIENSIS	32				16				16	
12 VITRINELLA HELICOIDEA	48								16	
13 NINOE NIGRIPES	16	16								16
14 NEREIS SP					32	16				
15 AMPELISCA ABDITA	16	16								
16 NEREIS SUCCINEA		16			16					
17 ABRA AEQUALIS	16									
18 CLYMENELLA ZONALIS	16									
19 GIANT SPERM	16									
20 PELECYPODA	16									
21 BATEA CARTHARINENSIS	16									
22 ELASMOPUS RAPAX	16									
23 CLYTIA CORONATA (COLONIES)	16									
24 CALLIANASSA LATISPINA					16					
25 MAGELONA ROSEA					16					
26 LEPIDASTHENIA SP									16	
27 NEMERTEA (YELLOW BANDED)										16
28 PAGURUS ANNULIPES										16
29 ASYCHIS ELONGATA									16	
30 SPIOCARCINUS LOBATUS									16	
TOTAL NUMBER OF INDIVIDUALS	544	480			672	256			272	208

TABLE E64
EXPERIMENTAL STUDY BENTHIC DATA: POST-DISPOSAL PHASE SAMPLES.
NUMBER OF INDIVIDUALS/SQ.M. OF EACH SPECIES COLLECTED AT STATION 14-3 ON 24 NOV 75

SURF TEMP	SURF SAL	BOT TEMP	BOT SAL	DEPTH	SED TEMP	TIME ON	TIME OFF
16.5		21.0		16.0	21.5	1125	1235

SEDIMENTS: MUDDY SAND WITH LARGE SHELLS. 4 AND 5 WITH MUCH BEAUMONT CLAY.

SPECIES	REPLICATES									
	1		2		3		4		5	
	ADLT	YNG	ADLT	YNG	ADLT	YNG	ADLT	YNG	ADLT	YNG
1 REPLICATES NOT ANALYZED			****	****			****	****		
2 MAGELONA SP	48				560				16	
3 PINNIXA CRISTATA	16	272				96			16	16
4 AMPELISCA ABDITA					80	80			128	32
5 BALANOGLOSSUS	176				80	32			16	
6 LUMBRINERIS TENUIS		16				64				112
7 PRIONOSPIO PINNATA	16					128				
8 MESOCHAETOPTERUS TAYLORI					112					
9 CEREBRATULUS LACTEUS		32			16	32			16	
10 MEDIOMASTUS CALIFORNIENSIS					96					
11 ELASMOPUS RAPAX					64				16	
12 LEPIDASTHENIA SP		32				16				16
13 PINNIXA LUNZI		32								32
14 NEREIS SUCCINEA					16				16	32
15 PAGURUS ANNULIPES						16				48
16 TELLINA VERSICOLOR	16								32	
17 ABRA AEQUALIS					32	16				
18 DIOPATRA CUPREA						16				32
19 SIGAMBRA TENTACULATA					32					16
20 CLYTIA CORONATA (COLONIES)					16				32	
21 SPIOCHAETOPTERUS OCULATUS									48	
22 BATEA CARTHARINENSIS									48	
23 MONOCULODES SP	32									
24 OXYUROSTYLIS SALINOI					16				16	
25 MICROPANOPE NUTTINGI									32	
26 NASSARIUS ACUTUS	16									
27 ARICIDEA SP	16									
28 CANTHARUS CANCELLARIUS		16								
29 LISTRIELLA SP	16									
30 COSSURA DELTA					16					
31 NEREIS SP					16					
32 ARMANDIA AGILIS					16					
33 EUCERAMUS PRAELONGUS					16					
34 AMPHIPODA, UN ID					16					
35 LOIMIA VIRIDIS					16					
36 ALPHEUS FLORIDANUS									16	
37 NEOPANOPE TEXANA										16
38 NEMERTEA (WHITE)					16					
39 CALLIANASSA ACANTHOCHIRUS										16
40 HEPATUS EPHELITICUS									16	
TOTAL NUMBER OF INDIVIDUALS	352	400			1232	496			464	368

TABLE E65
EXPERIMENTAL STUDY BENTHIC DATA: POST-DISPOSAL PHASE SAMPLES.
NUMBER OF INDIVIDUALS/SQ.M. OF EACH SPECIES COLLECTED AT STATION 14-4 ON 24 NOV 75

SURF TEMP	SURF SAL	BOT TEMP	BOT SAL	DEPTH	SED TEMP	TIME ON	TIME OFF
17.0		21.5		16.0	20.5	1430	1505

SEDIMENTS: 1 MM OXIDIZED MUD OVER MUDDY SAND AND CLAY. FEW LARGE SHELLS.

SPECIES	REPLICATES									
	1		2		3		4		5	
	ADLT	YNG	ADLT	YNG	ADLT	YNG	ADLT	YNG	ADLT	YNG
1 REPLICATES NOT ANALYZED			****	****			****	****		
2 MAGELONA SP					80				448	
3 LUMBRINERIS TENUIS	16	32							16	176
4 CEREBRATULUS LACTEUS		16								112
5 PRIONOSPIO PINNATA		16							80	32
6 NINOE NIGRIPES									48	32
7 AMPELISCA ABDITA					16				32	16
8 DIOPATRA CUPREA	16				16					16
9 MEDIOMASTUS CALIFORNIENSIS					16				32	
10 NEMERTEA (YELLOW BANDED)										48
11 ANCISTROSYLLIS JONESI		32								
12 NUCULANA CONCENTRICA		16							16	
13 SIGAMBRA WASSI					16				16	
14 CLYMENELLA TORQUATA CALIDA						16			16	
15 GIANT SPERM					16				16	
16 PINNIXA CRISTATA										32
17 COSSURA DELTA		16								
18 THARYX SETIGERA	16									
19 MALACOCEROS SP		16								
20 CIRRATULUS HEDGPETHI		16								
21 PHORONIS ARCHITECTA					16					
22 TELLINA VERSICOLOR						16				
23 ABRA AEQUALIS									16	
24 HEMIPHOLIS ELONGATA										16
25 NEREIS SP									16	
26 PSEUDOPOLYDORA SP									16	
27 MICROPHOLIS ATRA										16
28 MAGELONA ROSEA									16	
29 CORBULA BARRATTIANA									16	
30 LOVENELLA GRACILIS (COL)									16	
31 TELLINA IRIS									16	
32 STHENELAIS BOA									16	
33 POECILOCHAETUS JOHNSONI									16	
34 MONOCULODES SP									16	
TOTAL NUMBER OF INDIVIDUALS	48	160			176	32			880	496

TABLE E66
EXPERIMENTAL STUDY BENTHIC DATA: POST-DISPOSAL PHASE SAMPLES.
NUMBER OF INDIVIDUALS/SQ.M. OF EACH SPECIES COLLECTED AT STATION 14-5 ON 24 NOV 75

SURF TEMP	SURF SAL	BOT TEMP	BOT SAL	DEPTH	SED TEMP	TIME ON	TIME OFF
16.0		21.0		16.0	21.0	1255	1410

SEDIMENTS: 2 MM OXIDIZED MUD OVER SANDY GRAY CLAY.

SPECIES	REPLICATES									
	1		2		3		4		5	
	ADLT	YNG	ADLT	YNG	ADLT	YNG	ADLT	YNG	ADLT	YNG
1 REPLICATES NOT ANALYZED			****	****			****	****		
2 MAGELONA SP	432				496				256	
3 LUMBRINERIS TENUIS		64				64				112
4 NUCULANA CONCENTRICA	16				48				48	112
5 AMPELISCA ABDITA					16	32			96	16
6 DIOPATRA CUPREA	16				16				96	
7 CEREBRATULUS LACTEUS					16	64			16	32
8 PRIONOSPIO PINNATA		32			16	16				48
9 NINOE NIGRIPES	16								32	16
10 HEMIPHOLIS ELONGATA					16	32				16
11 ANCISTROSYLLIS JONESI									48	16
12 PINNIXA CRISTATA					16	32				16
13 NEREIS SP	16				16	16				
14 NEMERTEA (YELLOW BANDED)		16			16					16
15 CLYMENELLA ZONALIS		32								
16 ELASMOPUS RAPAX					16				16	
17 ASYCHIS ELONGATA									16	16
18 COSSURA DELTA	16									
19 MICROPHOLIS ATRA	16									
20 CLYMENELLA TORQUATA CALIDA	16									
21 LISTRIELLA SP	16									
22 GLYCERA AMERICANA					16					
23 LEPIDASTHENIA SP						16				
24 NEREIS SUCCINEA					16					
25 SIGAMBRA TENTACULATA					16					
26 GIANT SPERM					16					
27 OXYUROSTYLIS SALINOI					16					
28 OGYRIDES LIMICOLA					16					
29 NEMERTEA (YELLOW & PURPLE)										16
30 PHORONIS ARCHITECTA									16	
31 SPIOCHAETOPTERUS OCULATUS									16	
32 NEMERTEA (WHITE)									16	
33 MAGELONA ROSEA									16	
34 CIRRATULUS HEDGPETHI									16	
35 ANEMONE (SAND ENCRUSTED)									16	
36 CANTHARUS CANCELLARIUS									16	
37 TELLINA VERSICOLOR									16	
TOTAL NUMBER OF INDIVIDUALS	560	144			784	272			752	432

TABLE E67
EXPERIMENTAL STUDY BENTHIC DATA: POST-DISPOSAL PHASE SAMPLES.
NUMBER OF INDIVIDUALS/SQ.M. OF EACH SPECIES COLLECTED AT STATION 12-1 ON 3 DEC 75

SURF TEMP	SURF SAL	BOT TEMP	BOT SAL	DEPTH	SED TEMP	TIME ON	TIME OFF
15.0	28.0	17.0	30.0	11.0	17.0	830	930

SEDIMENTS: 2 MM OXIDIZED SILT OVER THICK GRAY CLAY.

SPECIES	REPLICATES									
	1		2		3		4		5	
	ADLT	YNG	ADLT	YNG	ADLT	YNG	ADLT	YNG	ADLT	YNG
1 REPLICATES NOT ANALYZED			****	****			****	****		
2 MAGELONA SP		16			48				224	
3 NUCULANA CONCENTRICA	16	16			112	48			32	
4 CEREBRATULUS LACTEUS						16			48	112
5 PRIONOSPIO PINNATA					64	48				32
6 NEREIS SP					32	32			48	
7 DIOPATRA CUPREA					64				32	
8 LUMBRINERIS TENUIS						32				32
9 ANCISTROSYLLIS JONESI					32	16				
10 NINOE NIGRIPES					32				16	
11 COSSURA DELTA									16	16
12 CLYMENELLA ZONALIS					16					
13 SIGAMBRA WASSI					16					
14 CIRRATULUS HEDGPETHI					16					
15 TELLINA VERSICOLOR									16	
16 GYPTIS VITTATA									16	
17 AUTOMATE EVERMANNI									16	
18 HEMIPHOLIS ELONGATA					16					
TOTAL NUMBER OF INDIVIDUALS	16	32			448	192			464	192

TABLE E68
EXPERIMENTAL STUDY BENTHIC DATA: POST-DISPOSAL PHASE SAMPLES.
NUMBER OF INDIVIDUALS/SQ.M. OF EACH SPECIES COLLECTED AT STATION 12-2 ON 3 DEC 75

SURF TEMP	SURF SAL	BOT TEMP	BOT SAL	DEPTH	SED TEMP	TIME ON	TIME OFF
15.5	28.0	16.5	30.0	11.0	17.5	940	1040

SEDIMENTS: GRAY CLAY WITH SAND.

SPECIES	REPLICATES									
	1		2		3		4		5	
	ADLT	YNG	ADLT	YNG	ADLT	YNG	ADLT	YNG	ADLT	YNG
1 REPLICATES NOT ANALYZED			****	****			****	****		
2 MAGELONA SP	96				256				32	
3 LUMBRINERIS TENUIS		208				16			16	16
4 DIOPATRA CUPREA	48				80				48	
5 CEREBRATULUS LACTEUS		48				16				48
6 NEREIS SP	96				16					
7 HEMIPHOLIS ELONGATA	64				32					
8 ABRA AEQUALIS	16					48			16	
9 PRIONOSPIO PINNATA	16	32			16	16				
10 NEREIS SUCCINEA	48				16					
11 GIANT SPERM	16				48					
12 NINOE NIGRIPES	16				32					
13 NOTOMASTUS LATERICEUS		16			16	16				
14 NUCULANA CONCENTRICA		16			16	16				
15 NEPHTYS INCISA					32				16	
16 LEPIDASTHENIA SP		16			16					
17 NEMERTEA (YELLOW BANDED)		32								
18 AUTOMATE EVERMANNI					16				16	
19 AMPELISCA ABDITA	16									
20 GLYCERA AMERICANA		16								
21 MEDIOMASTUS CALIFORNIENSIS	16									
22 SIGAMBRA WASSI	16									
23 THARYX SETIGERA		16								
24 SIGAMBRA TENTACULATA					16					
25 TELLINA VERSICOLOR					16					
26 CORBULA BARRATTANIA						16				
27 HEXAPANOPEUS AUGUSTIFRONS						16				
TOTAL NUMBER OF INDIVIDUALS	464	400			624	160			144	64

TABLE E69
EXPERIMENTAL STUDY BENTHIC DATA: POST-DISPOSAL PHASE SAMPLES.
NUMBER OF INDIVIDUALS/SQ.M. OF EACH SPECIES COLLECTED AT STATION 12-3 ON 3 DEC 75

SURF TEMP	SURF SAL	BOT TEMP	BOT SAL	DEPTH	SED TEMP	TIME ON	TIME OFF
16.0	30.0	17.0	32.0	11.0	17.0	1050	1145

SEDIMENTS: DREDGE SPOIL, SHELL, AND BEAUMONT CLAY.

SPECIES	REPLICATES									
	1		2		3		4		5	
	ADLT	YNG	ADLT	YNG	ADLT	YNG	ADLT	YNG	ADLT	YNG
1 REPLICATES NOT ANALYZED			****	****			****	****		
2 NEREIS SP	16	48			48				96	32
3 MAGELONA SP	48	16			16	16			80	
4 LUMBRINERIS TENUIS		32				16				64
5 PAGURUS ANNULIPES						32				80
6 PRIONOSPIO PINNATA	32				16					48
7 CEREBRATULUS LACTEUS		48				16				16
8 MEDIOMASTUS CALIFORNIENSIS									64	
9 NEMERTEA (YELLOW BANDED)										48
10 DIOPATRA CUPREA						16			16	
11 PRIONOSPIO DAYI									32	
12 HEMIPHOLIS ELONGATA	16									
13 NUCULANA CONCENTRICA						16				
14 ANCISTROSYLLIS HARTMANAE	16									
15 SIGAMBRA TENTACULATA						16				
16 GIANT SPERM					16					
17 AGLAOPHAMUS VERRILLI									16	
18 NASSARIUS ACUTUS									16	
19 NATICA PUSILLA									16	
20 NEMERTEA (YELLOW & PURPLE)									16	
21 OWENIA FUSIFORMIS									16	
22 SPIOCHAETOPTERUS OCULATUS									16	
23 AMPHARETE ACUTIFRONS									16	
24 PINNIXA CRISTATA									16	
25 MAGELONA ROSEA									16	
26 CIRRATULUS HEDGPETHI									16	
27 CLYMENELLA TORQUATA CALIDA										16
TOTAL NUMBER OF INDIVIDUALS	128	144			96	128			448	304

TABLE E70
EXPERIMENTAL STUDY BENTHIC DATA: POST-DISPOSAL PHASE SAMPLES.
NUMBER OF INDIVIDUALS/SQ.M. OF EACH SPECIES COLLECTED AT STATION 12-4 ON 3 DEC 75

SURF TEMP	SURF SAL	BOT TEMP	BOT SAL	DEPTH	SED TEMP	TIME ON	TIME OFF
16.0	27.0	17.0	31.0	12.0	17.5	1410	1430

SEDIMENTS: SOFT GRAY CLAY.

SPECIES	REPLICATES									
	1		2		3		4		5	
	ADLT	YNG	ADLT	YNG	ADLT	YNG	ADLT	YNG	ADLT	YNG
1 REPLICATES NOT ANALYZED			****	****			****	****		
2 MAGELONA SP	176				352				224	
3 CEREBRATULUS LACTEUS	16	368								96
4 NEREIS SP	48	16			112				128	
5 PRIONOSPIO PINNATA						96			128	48
6 DIOPATRA CUPREA	64	16			112				48	
7 NUCULANA CONCENTRICA	128				64	32				
8 SIGAMBRA TENTACULATA	48				80					
9 SIGAMBRA WASSI	16				64				32	
10 LUMBRINERIS TENUIS		32				16				32
11 NINOE NIGRIPES	16				48				16	
12 ANCISTROSYLLIS JONESI						32			16	
13 PINNIXA CRISTATA		32								
14 ANADARA TRANSVERSA		16								
15 NEMERTEA (YELLOW BANDED)		16								
16 OWENIA FUSIFORMIS		16								
17 PSEUDOPOLYDORA SP	16									
18 COSSURA DELTA					16					
19 MEDIOMASTUS CALIFORNIENSIS					16					
20 CLYMENELLA ZONALIS									16	
21 NEMERTEA (YELLOW & PURPLE)										16
22 NEPHTYS INCISA									16	
23 SPIOCHAETOPTERUS OCULATUS									16	
24 CALLIANASSA LATISPINA									16	
TOTAL NUMBER OF INDIVIDUALS	528	512			864	176			656	192

TABLE E71
EXPERIMENTAL STUDY BENTHIC DATA: POST-DISPOSAL PHASE SAMPLES.
NUMBER OF INDIVIDUALS/SQ.M. OF EACH SPECIES COLLECTED AT STATION 12-5 ON 3 DEC 75

SURF TEMP	SURF SAL	BOT TEMP	BOT SAL	DEPTH	SED TEMP	TIME ON	TIME OFF
17.0	27.0	17.0	31.0	12.0	17.0	1345	1425

SEDIMENTS: 5 CM SAND AND SHELL OVER GRAY CLAY.

SPECIES	REPLICATES									
	1		2		3		4		5	
	ADLT	YNG	ADLT	YNG	ADLT	YNG	ADLT	YNG	ADLT	YNG
1 REPLICATES NOT ANALYZED			****	****			****	****		
2 NEREIS SP	32				160	32			80	160
3 SIGAMBRA WASSI	160	16			32				96	16
4 MAGELONA SP	128								144	
5 TELLINA VERSICOLOR		16							48	48
6 LUMBRINERIS TENUIS						48				64
7 DIOPATRA CUPREA	32				16				32	
8 SIGAMBRA TENTACULATA	16				16				32	
9 NEREIS SUCCINEA	32	16								
10 AMPELISCA ABDITA									48	
11 NUCULANA CONCENTRICA		32								
12 MEDIOMASTUS CALIFORNIENSIS									32	
13 EUCERAMUS PRAELONGUS									32	
14 ANCISTROSYLLIS JONESI	16									
15 PRIONOSPIO PINNATA		16								
16 ACETES AMERICANUS (CAR)	16									
17 PECTINARIA GOULDII					16					
18 CORBULA SWIFTIANA					16					
19 AGLAOPHAMUS VERRILLI										16
20 CEREBRATULUS LACTEUS										16
21 NEMERTEA (YELLOW BANDED)										16
22 NOTOMASTUS HEMIPODUS										16
23 SPIOCHAETOPTERUS OCULATUS									16	
24 PRIONOSPIO CIRRIFERA									16	
25 CORBULA BARRATTANIA									16	
26 LISTRIELLA SP									16	
27 STYLOCHUS ELLIPTICUS									16	
28 BOCCARDIA HAMATA									16	
TOTAL NUMBER OF INDIVIDUALS	432	96			256	80			640	352

TABLE E72
EXPERIMENTAL STUDY BENTHIC DATA: POST-DISPOSAL PHASE SAMPLES.
NUMBER OF INDIVIDUALS/SQ.M. OF EACH SPECIES COLLECTED AT STATION 27-1 ON 3 DEC 75

SURF TEMP	SURF SAL	BOT TEMP	BOT SAL	DEPTH	SED TEMP	TIME ON	TIME OFF
16.5	25.5	17.0	30.0	13.0	18.0	1545	1615

SEDIMENTS: SOFT GRAY CLAY.

SPECIES	REPLICATES									
	1		2		3		4		5	
	ADLT	YNG	ADLT	YNG	ADLT	YNG	ADLT	YNG	ADLT	YNG
1 REPLICATES NOT ANALYZED			****	****			****	****		
2 MAGELONA SP	80				512				336	16
3 CEREBRATULUS LACTEUS		16			64	64				416
4 NUCULANA CONCENTRICA	32	64				16			16	48
5 LUMBRINERIS TENUIS	16					112				32
6 PINNIXA CRISTATA		32				16				112
7 PRIONOSPIO PINNATA					16	112				
8 NEREIS SP					48	32			16	16
9 GYPTIS VITTATA						112				
10 SIGAMBRA TENTACULATA		16			16				48	16
11 VITRINELLA HELICOIDEA	80				16					
12 DIOPATRA CUPREA	16				32				16	
13 MEDIOMASTUS CALIFORNIENSIS	16				48					
14 LEPIDASTHENIA SP	16				16	16				
15 COSSURA DELTA						32				16
16 SIGAMBRA WASSI					48					
17 VOLVULELLA TEXASIANA	16				16					
18 NINOE NIGRIPES									16	16
19 ANCISTROSYLLIS JONESI		16								
20 NATICA PUSILLA	16									
21 AMPELISCA ABDITA					16					
22 GLYCINDE SOLITARIA					16					
23 NEMERTEA (YELLOW BANDED)					16					
24 ARMANDIA AGILIS						16				
25 ARICIDEA SP					16					
26 PARANTHUS RAPIFORMIS						16				
27 NEPHTYS INCISA					16					
28 CIRRATULUS HEDGPETHI					16					
29 PAGURUS ANNULIPES									16	
30 ELECTRA SP (COLONIES)									16	
31 MONOCULODES SP									16	
TOTAL NUMBER OF INDIVIDUALS	288	144			928	544			496	688

TABLE E73
EXPERIMENTAL STUDY BENTHIC DATA: POST-DISPOSAL PHASE SAMPLES.
NUMBER OF INDIVIDUALS/SQ.M. OF EACH SPECIES COLLECTED AT STATION 27-2 ON 4 DEC 75

SURF TEMP	SURF SAL	BOT TEMP	BOT SAL	DEPTH	SED TEMP	TIME ON	TIME OFF
17.0	30.0	17.0	31.0	13.0	17.0	945	1030

SEDIMENTS: GRAY CLAY. SHELLS NEAR BOTTOM.

SPECIES	REPLICATES									
	1		2		3		4		5	
	ADLT	YNG	ADLT	YNG	ADLT	YNG	ADLT	YNG	ADLT	YNG
1 REPLICATES NOT ANALYZED			****	****			****	****		
2 VITRINELLA HELICOIDEA	112				272				32	
3 MAGELONA SP	64				112				48	
4 NUCULANA CONCENTRICA	32	16			80	32			32	32
5 LUMBRINERIS TENUIS		48								80
6 NINOE NIGRIPES					32	16				
7 SIGAMBRA WASSI					16					32
8 ABRA AEQUALIS	16								16	
9 PINNIXA CRISTATA		16				16				
10 SIGAMBRA TENTACULATA					32					
11 GLYCERA AMERICANA	16									
12 TEREBRA PROTEXTA	16									
13 LUCINA AMIANTIS		16								
14 CEREBRATULUS LACTEUS					16					
15 LEPIDASTHENIA SP					16					
16 DIOPATRA CUPREA									16	
17 NEREIS SP										16
TOTAL NUMBER OF INDIVIDUALS	256	96			576	64			144	160

TABLE E74
EXPERIMENTAL STUDY BENTHIC DATA: POST-DISPOSAL PHASE SAMPLES.
NUMBER OF INDIVIDUALS/SQ.M. OF EACH SPECIES COLLECTED AT STATION 27-3 ON 4 DEC 75

SURF TEMP	SURF SAL	BOT TEMP	BOT SAL	DEPTH	SED TEMP	TIME ON	TIME OFF
16.5	29.0	17.0	30.0	13.0	17.0	850	935

SEDIMENTS: 1 TO 2 CM OXIDIZED SILT OVER GRAY CLAY.

SPECIES	REPLICATES									
	1		2		3		4		5	
	ADLT	YNG	ADLT	YNG	ADLT	YNG	ADLT	YNG	ADLT	YNG
1 REPLICATES NOT ANALYZED			****	****			****	****		
2 MAGELONA SP	64				48				288	
3 PARAMYA SUBOVATA									112	272
4 DIOPATRA CUPREA	80	16			80				48	
5 NUCULANA CONCENTRICA	48	16			16	16			48	64
6 LUMBRINERIS TENUIS		64								80
7 VITRINELLA HELICOIDEA	64				16				16	
8 CEREBRATULUS LACTEUS	16								32	32
9 NEREIS SP	48								32	
10 SIGAMBRA TENTACULATA	32								32	
11 ABRA AEQUALIS	16								32	
12 VOLVULELLA TEXASIANA					16				32	
13 SIGAMBRA WASSI									32	16
14 ANCISTROSYLLIS JONESI	16				16					
15 MEDIOMASTUS CALIFORNIENSIS	16				16					
16 PINNIXA CRISTATA		16								16
17 PRIONOSPIO PINNATA		16							16	
18 CORBULA BARRATTANIA					16				16	
19 AGLAOPHAMUS VERRILLI									32	
20 COSSURA DELTA										32
21 CLYMENELLA ZONALIS	16									
22 PARANTHUS RAPIFORMIS						16				
23 ASYCHIS ELONGATA					16					
24 AMPELISCA ABDITA									16	
25 NINOE NIGRIPES									16	
26 CALLIANASSA LATISPINA										16
27 ELASMOPUS RAPAX									16	
28 CERATOCEPHALE SP.									16	
TOTAL NUMBER OF INDIVIDUALS	416	128			240	32			832	528

TABLE E75
EXPERIMENTAL STUDY BENTHIC DATA: POST-DISPOSAL PHASE SAMPLES.
NUMBER OF INDIVIDUALS/SQ.M. OF EACH SPECIES COLLECTED AT STATION 27-4 ON 4 DEC 75

SURF TEMP	SURF SAL	BOT TEMP	BOT SAL	DEPTH	SED TEMP	TIME ON	TIME OFF
18.0	30.5	17.5	31.0	13.0	17.0	1130	1205

SEDIMENTS: THICK GRAY CLAY.

SPECIES	REPLICATES									
	1		2		3		4		5	
	ADLT	YNG	ADLT	YNG	ADLT	YNG	ADLT	YNG	ADLT	YNG
1 REPLICATES NOT ANALYZED			****	****			****	****		
2 MAGELONA SP	576				528				256	
3 LUMBRINERIS TENUIS		48			16	16				48
4 VITRINELLA HELICOIDEA	32				80					
5 COSSURA DELTA		64				16				16
6 DIOPATRA CUPREA	48								32	
7 NINOE NIGRIPES		16			32					16
8 NUCULANA CONCENTRICA		32			32					
9 MEDIOMASTUS CALIFORNIENSIS	16				32					
10 PINNIXA CRISTATA		48								
11 SIGAMBRA TENTACULATA	16				16				16	
12 AGLAOPHAMUS VERRILLI	16	16								
13 CEREBRATULUS LACTEUS		16								16
14 NEREIS SP	32									
15 NEMERTEA (YELLOW BANDED)						32				
16 NEMERTEA (WHITE)		16								
17 BALANOGLOSSUS	16									
18 PSEUDOPOLYDORA SP		16								
19 NEMERTEA (YELLOW & PURPLE)						16				
20 SPIOCHAETOPTERUS OCULATUS					16					
21 CIRRATULUS HEDGPETHI						16				
22 ABRA AEQUALIS									16	
23 PRIONOSPIO PINNATA									16	
TOTAL NUMBER OF INDIVIDUALS	752	272			752	96			336	96

TABLE E76
EXPERIMENTAL STUDY BENTHIC DATA: POST-DISPOSAL PHASE SAMPLES.
NUMBER OF INDIVIDUALS/SQ.M. OF EACH SPECIES COLLECTED AT STATION 27-5 ON 4 DEC 75

SURF TEMP	SURF SAL	BOT TEMP	BOT SAL	DEPTH	SED TEMP	TIME ON	TIME OFF
17.0	30.0	18.0	31.0	13.0	17.0	1045	1115

SEDIMENTS: VERY LOOSE SAND AND SHELL HASH

SPECIES	REPLICATES 1		2		3		4		5	
	ADLT	YNG	ADLT	YNG	ADLT	YNG	ADLT	YNG	ADLT	YNG
1 REPLICATES NOT ANALYZED			****	****			****	****		
2 MAGELONA SP	592				336				16	16
3 LUMBRINERIS TENUIS		144			32	160				
4 DIOPATRA CUPREA	64				96	32			112	
5 NEREIS SP	112				80	16				
6 AMPELISCA ABDITA	32	48			16	16				
7 NUCULANA CONCENTRICA	16	48							16	32
8 CEREBRATULUS LACTEUS		16				64				
9 HEMIPHOLIS ELONGATA	48	16								
10 NINOE NIGRIPES		32			16	16				
11 ANCISTROSYLLIS JONESI	16								16	
12 PINNIXA CRISTATA						32				
13 ASYCHIS ELONGATA									16	16
14 ABRA AEQUALIS	16									
15 COSSURA DELTA		16								
16 OWENIA FUSIFORMIS	16									
17 PRIONOSPIO PINNATA	16									
18 SIGAMBRA TENTACULATA	16									
19 SIGAMBRA WASSI	16									
20 PAGURUS ANNULIPES	16									
21 ELASMOPUS RAPAX	16									
22 LISTRIELLA SP	16									
23 SPIOCHAETOPTERUS OCULATUS					16					
24 CORBULA BARRATTANIA					16					
25 MICROPANOPE TEXANA						16				
26 SCHISTOMERINGOS RUDOLPHI					16					
27 AUTOMATE EVERMANNI									16	
28 BOCCARDIA SP									16	
TOTAL NUMBER OF INDIVIDUALS	1008	320			624	352			208	64

TABLE E77
EXPERIMENTAL STUDY BENTHIC DATA: POST-DISPOSAL PHASE SAMPLES.
NUMBER OF INDIVIDUALS/SQ.M. OF EACH SPECIES CCLLECTED AT STATION 2-1 ON 20 JAN 76

SURF TEMP	SURF SAL	BOT TEMP	BOT SAL	DEPTH	SED TEMP	TIME ON	TIME OFF
12.0	25.0	12.0	26.0	9.0	12.0	1300	1325

SEDIMENTS:

SPECIES	REPLICATES									
	1		2		3		4		5	
	ADLT	YNG	ADLT	YNG	ADLT	YNG	ADLT	YNG	ADLT	YNG
1 BRANCHIOSTOMA CARIBAEUM	64	128					16			
2 SPIOPHANES BOMBYX	64			64		32				16
3 PRICNCSPIO TREADWELLI	144	16			16					
4 NEMERTEA (YELLOW BANDED)		112				16				16
5 ABRA AEQUALIS		96		16						16
6 DISPIC UNCINATA	80	48								
7 MAGELONA SP	16						16		48	
8 PRICNCSPIO PINNATA		16		16		16		16		16
9 COROPHIUM ACHERUSICUM	32				32					
10 PHORONIS ARCHITECTA			32						32	
11 DIOPATRA CUPREA					48		16			
12 NEREIS SUCCINEA						32		32		
13 NEREIS SP			16						16	16
14 MELINNA MACULATA					32					16
15 ELECTRA SP (COLONIES)					48					
16 BATEA CARTHARINENSIS					48					
17 CEREBRATULUS LACTEUS		16					16			
18 SPIO PETTIBONEAE	32									
19 ANADARA TRANSVERSA					16			16		
20 NASSARIUS ACUTUS					32					
21 ANAITIDES ERYTHROPHYLLUS						16				16
22 THALASSEMA HARTMANI		16								
23 NEMERTEA (WHITE)		16								
24 PAGURUS ANNULIPES	16									
25 SPIOCHAETCPTERUS CCULATUS		16								
26 BUNODACTIS TEXENSIS					16					
27 ANCISTROSYLLIS JONESI							16			
28 MEDIOMASTUS CALIFORNIENSIS							16			
29 BOCCARDIA SP										16
30 PSEUDOPOLYDORA SP										16
TOTAL NUMBER OF INDIVIDUALS	448	480	48	96	288	112	96	64	96	144

TABLE E78
EXPERIMENTAL STUDY BENTHIC DATA: POST-DISPOSAL PHASE SAMPLES.
NUMBER OF INDIVIDUALS/SQ.M. OF EACH SPECIES COLLECTED AT STATION 2-2 ON 20 JAN 76

SURF TEMP	SURF SAL	BOT TEMP	BOT SAL	DEPTH	SED TEMP	TIME ON	TIME OFF
12.0	25.0	12.0	26.0	11.0	12.0	1335	1350

SEDIMENTS: 5 CM SAND OVER SANDY MUD AND SHELL

SPECIES	REPLICATES									
	1		2		3		4		5	
	ADLT	YNG	ADLT	YNG	ADLT	YNG	ADLT	YNG	ADLT	YNG
1 REPLICATES NOT ANALYZED			****	****			****	****		
2 MEDIOMASTUS CALIFORNIENSIS	1488	16			352				416	
3 MAGELONA SP	656				112				528	
4 PRIONOSPIO PINNATA	352	176			48				272	16
5 NEREIS SP	80	32			48				144	16
6 NEMERTEA (YELLOW BANDED)	128				64				48	
7 ABRA AEQUALIS		112				32				32
8 PSEUDEURYTHOE AMBIGUA	16	16							96	32
9 SIGAMBRA TENTACULATA	32	96								16
10 LUMBRINERIS TENUIS	16	16				32			32	16
11 COROPHIUM ACHERUSICUM									64	32
12 CEREBRATULUS LACTEUS	16	16							32	16
13 PRIONOSPIO CIRRIFERA	16									48
14 ANADARA TRANSVERSA										64
15 NEMERTEA (WHITE)									64	
16 SPIOPHANES BOMBYX		48								
17 PAGURUS ANNULIPES									48	
18 BUNODACTIS TEXENSIS									48	
19 OGYRIDES LIMICOLA									48	
20 GLYCINDE SOLITARIA		32								
21 PHORONIS ARCHITECTA	16				16					
22 TELLINA VERSICOLOR		16								16
23 NEMERTEA (YELLOW & PURPLE)					16				16	
24 SCOLEPSIS SQUAMATA					16				16	
25 NEREIS SUCCINEA										32
26 ANCISTROSYLLIS JONESI	16									
27 COSSURA DELTA		16								
28 STHENELAIS BOA	16									
29 NOTOMASTUS LATERICEUS					16					
30 LEPIDOPA BENEDICTI					16					
31 SPIOCHAETOPTERUS OCULATUS					16					
32 DRILONEREIS LONGA					16					
33 CALLIANASSA ACANTHOCHIRUS						16				
34 AMPELISCA ABDITA									16	
35 DIOPATRA CUPREA									16	
36 HEMIPHOLIS ELONGATA									16	
37 MULINIA LATERALIS										16
38 OXYUROSTYLIS SALINOI									16	
39 ANAITIDES ERYTHROPHYLLUS										16
40 NEMATODA									16	
41 MAGELONA ROSEA									16	
42 AMPHARETE (EYES)									16	
TOTAL NUMBER OF INDIVIDUALS	2848	592			736	80			1984	368

TABLE E79
EXPERIMENTAL STUDY BENTHIC DATA: POST-DISPOSAL PHASE SAMPLES.
NUMBER OF INDIVIDUALS/SQ.M. OF EACH SPECIES COLLECTED AT STATION 2-3 ON 20 JAN 76

SURF TEMP	SURF SAL	BOT TEMP	BOT SAL	DEPTH	SED TEMP	TIME ON	TIME OFF
12.0	25.0	12.5	26.0	11.0	13.0	1405	1430

SEDIMENTS: 1-2 CM OXIDIZED MUD OVER SANDY MUD, LITTLE GRAY CLAY.

SPECIES	REPLICATES									
	1		2		3		4		5	
	ADLT	YNG	ADLT	YNG	ADLT	YNG	ADLT	YNG	ADLT	YNG
1 REPLICATES NOT ANALYZED			****	****			****	****		
2 PRIONOSPIO PINNATA	144	96			2288	432			32	32
3 MEDIOMASTUS CALIFORNIENSIS	192	16			1216					
4 MAGELONA SP	336				288				320	80
5 COSSURA DELTA		16			32	48			128	
6 NEREIS SP		16				48				112
7 NEMERTEA (YELLOW BANDED)	32				96				16	
8 LUMBRINERIS TENUIS		48				16			16	64
9 MULINIA LATERALIS		128								
10 CLYMENELLA ZONALIS					80				16	
11 SPIOCHAETOPTERUS OCULATUS									64	
12 CEREBRATULUS LACTEUS	32	16								
13 NOTOMASTUS LATERICEUS	32				16					
14 DIOPATRA CUPREA	16				16					
15 PAGURUS ANNULIPES	32									
16 COROPHIUM ACHERUSICUM	32									
17 AMPHARETE (EYES)	16								16	
18 SPIOPHANES BOMBYX	16					16				
19 GLYCINDE SOLITARIA					32					
20 NINOE NIGRIPES									32	
21 NUCULANA CONCENTRICA									32	
22 PHORONIS ARCHITECTA									32	
23 NEMERTEA (YELLOW & PURPLE)	16									
24 OGYRIDES LIMICOLA	16									
25 ANAITIDES ERYTHROPHYLLUS		16								
26 GYPTIS VITTATA	16									
27 ABRA AEQUALIS						16				
28 PSEUDEURYTHOE AMBIGUA						16				
29 SIGAMBRA TENTACULATA					16					
30 SIGAMBRA WASSI					16					
31 HEMIPHOLIS ELONGATA									16	
32 NATICA PUSILLA									16	
33 OWENIA FUSIFORMIS									16	
34 ANACHIS OBESA									16	
35 NEPHTYS PICTA									16	
36 NEMERTEA (WHITE)					16					
TOTAL NUMBER OF INDIVIDUALS	928	352			4112	592			784	288

TABLE E80
EXPERIMENTAL STUDY BENTHIC DATA: POST-DISPOSAL PHASE SAMPLES.
NUMBER OF INDIVIDUALS/SQ.M. OF EACH SPECIES COLLECTED AT STATION 2-4 ON 20 JAN 76

SURF TEMP	SURF SAL	BOT TEMP	BOT SAL	DEPTH	SED TEMP	TIME ON	TIME OFF
12.0	25.0	12.0	25.0	11.0	12.0	1445	1505

SEDIMENTS: 1 CM OXIDIZED MUD OVER MUDDY SAND.

SPECIES	REPLICATES									
	1		2		3		4		5	
	ADLT	YNG	ADLT	YNG	ADLT	YNG	ADLT	YNG	ADLT	YNG
1 REPLICATES NOT ANALYZED			****	****			****	****		
2 MEDIOMASTUS CALIFORNIENSIS	544				560				672	
3 MAGELONA SP	432	32			272	48			304	16
4 PRIONOSPIO PINNATA	384	16			176	32			96	16
5 CLYMENELLA ZONALIS	64	96			16					16
6 NEMERTEA (YELLOW BANDED)	80				80				32	
7 PSEUDEURYTHOE AMBIGUA	64	64			16					
8 LUMBRINERIS TENUIS		32			16	48				16
9 NEREIS SP	48				16	16			32	
10 GLYCINDE SOLITARIA	16	32				16				16
11 BALANOGLOSSUS	32				48					
12 AMPHARETE (EYES)	32				32				16	
13 PRIONOSPIO CIRRIFERA					80					
14 NEREIS SUCCINEA	32	16				16				
15 SPIOCHAETOPTERUS OCULATUS	32				16	16				
16 GLYCERA AMERICANA		32			16					
17 NEMERTEA (YELLOW & PURPLE)	32				16					
18 PHORONIS ARCHITECTA	48									
19 SIGAMBRA TENTACULATA		16				32				
20 COSSURA DELTA						16			16	16
21 PINNIXA CRISTATA					32	16				
22 CEREBRATULUS LACTEUS		16			16					16
23 DIOPATRA CUPREA	16				16					
24 NOTOMASTUS LATERICEUS		16			16					
25 SIGAMBRA WASSI		16			16					
26 STHENELAIS BOA		32								
27 OWENIA FUSIFORMIS					16				16	
28 BUNODACTIS TEXENSIS					32					
29 SPIOPHANES BOMBYX									32	
30 COROPHIUM ACHERUSICUM									32	
31 ABRA AEQUALIS		16								
32 ANCISTROSYLLIS JONESI	16									
33 GYPTIS VITTATA		16								
34 VITRINELLA HELICOIDEA	16									
35 PRIONOSPIO DAYI		16								
36 HEMIPHOLIS ELONGATA					16					
37 PAGURUS ANNULIPES					16					
38 MALACOCEROS SP					16					
39 AGLAOPHAMUS VERRILLI									16	
40 PHASCOLION STROMBI									16	
TOTAL NUMBER OF INDIVIDUALS	1888	464			1552	256			1280	112

TABLE E81
EXPERIMENTAL STUDY BENTHIC DATA: POST-DISPOSAL PHASE SAMPLES.
NUMBER OF INDIVIDUALS/SQ.M. OF EACH SPECIES COLLECTED AT STATION 2-5 ON 20 JAN 76

SURF TEMP	SURF SAL	BOT TEMP	BOT SAL	DEPTH	SED TEMP	TIME ON	TIME OFF
12.0	25.0	12.5	26.0	12.0	13.0	1515	1535

SEDIMENTS: 1 CM OXIDIZED SANDY MUD OVER GRAY SANDY MUD AND MUCH BEAUMONT CLAY.

SPECIES	REPLICATES									
	1		2		3		4		5	
	ADLT	YNG	ADLT	YNG	ADLT	YNG	ADLT	YNG	ADLT	YNG
1 REPLICATES NOT ANALYZED			****	****			****	****		
2 MEDIOMASTUS CALIFORNIENSIS	48				96				160	
3 MAGELONA SP	48	16			160				64	
4 ANCISTROSYLLIS JONESI	16								128	32
5 PRIONOSPIO PINNATA	112				32				32	
6 ABRA AEQUALIS						128				16
7 COSSURA DELTA						16			112	
8 CEREBRATULUS LACTEUS		48				32				
9 DIOPATRA CUPREA	16				64					
10 PHORONIS ARCHITECTA					64					
11 AMPHARETE (EYES)					48				16	
12 LUMBRINERIS TENUIS	16				16	16				
13 NEMERTEA (YELLOW & PURPLE)	16								32	
14 OWENIA FUSIFORMIS	32				16					
15 SPIOPHANES BOMBYX						32				16
16 PARAMYA SUBOVATA		32								
17 AMPELISCA ABDITA						16				16
18 NEREIS SUCCINEA					16					16
19 DIPLODONTA SP						32				
20 ANCISTROSYLLIS HARTMANAE						16			16	
21 SIGAMBRA TENTACULATA									16	16
22 NEREIS SP					16	16				
23 NEMERTEA (YELLOW BANDED)									32	
24 MULINIA LATERALIS					16					
25 TELLINA VERSICOLOR						16				
26 PECTINARIA GOULDII					16					
27 NEMERTEA (YELLOW BANDED)									16	
28 NINOE NIGRIPES									16	
29 MAGELONA ROSEA									16	
30 LISTRIELLA SP									16	
31 COROPHIUM ACHERUSICUM										16
32 NEMATODA									16	
TOTAL NUMBER OF INDIVIDUALS	304	96			560	320			688	128

TABLE E82
EXPERIMENTAL STUDY BENTHIC DATA: POST-DISPOSAL PHASE SAMPLES.
NUMBER OF INDIVIDUALS/SQ.M. OF EACH SPECIES COLLECTED AT STATION 15-1 ON 23 JAN 76

SURF TEMP	SURF SAL	BOT TEMP	BOT SAL	DEPTH	SED TEMP	TIME ON	TIME OFF
13.0	25.0	13.0	28.0	8.0	13.0	1050	1113

SEDIMENTS: HARD MUDDY SAND.

SPECIES	REPLICATES									
	1		2		3		4		5	
	ADLT	YNG	ADLT	YNG	ADLT	YNG	ADLT	YNG	ADLT	YNG
1 REPLICATES NOT ANALYZED			****	****			****	****		
2 MAGELONA SP	144				176	16			128	64
3 PRIONOSPIO PINNATA	128	112			16	112			16	
4 MEDIOMASTUS CALIFORNIENSIS	16	16			80				112	32
5 ABRA AEQUALIS		80				64				16
6 PSEUDEURYTHOE AMBIGUA						48				96
7 NEREIS SP	64	16			16	16			16	
8 SPIOPHANES BOMBYX	32								32	64
9 SIGAMBRA TENTACULATA						64				48
10 LUMBRINERIS TENUIS		16				48				16
11 NASSARIUS ACUTUS									80	
12 COROPHIUM ACHERUSICUM		48							16	
13 DIOPATRA CUPREA					64					
14 OWENIA FUSIFORMIS	32									
15 OGYRIDES LIMICOLA	16								16	
16 SPIOCHAETOPTERUS OCULATUS	16	16								
17 PINNIXA CRISTATA						32				
18 PRIONOSPIO CIRRIFERA									32	
19 NEMERTEA (YELLOW BANDED)		16							16	
20 BALANOGLOSSUS					16	16				
21 CEREBRATULUS LACTEUS		16								
22 CLYMENELLA ZONALIS	16									
23 PARANTHUS RAPIFORMIS	16									
24 BRANCHIOSTOMA CARIBAEUM		16								
25 DRILONEREIS LONGA	16									
26 ANADARA TRANSVERSA						16				
27 LEPIDASTHENIA SP					16					
28 NEMERTEA (YELLOW & PURPLE)					16					
29 SIGAMBRA WASSI						16				
30 ANEMONE UN ID						16				
31 BUNODACTIS TEXENSIS						16				
32 AMPHARETE (EYES)					16					
33 AGLAOPHAMUS VERRILLI									16	
34 NEOPANOPE TEXANA									16	
TOTAL NUMBER OF INDIVIDUALS	496	352			416	480			496	336

TABLE E83
EXPERIMENTAL STUDY BENTHIC DATA: POST-DISPOSAL PHASE SAMPLES.
NUMBER OF INDIVIDUALS/SQ.M. OF EACH SPECIES COLLECTED AT STATION 15-2 ON 22 JAN 76

SURF TEMP	SURF SAL	BOT TEMP	BOT SAL	DEPTH	SED TEMP	TIME ON	TIME OFF
13.0	27.0	13.0	28.0	8.0	13.5	950	1002

SEDIMENTS: 2-3 CM SAND OVER MIXTURE OF SAND, CLAY, AND SOFT MUD.

SPECIES	REPLICATES									
	1		2		3		4		5	
	ADLT	YNG	ADLT	YNG	ADLT	YNG	ADLT	YNG	ADLT	YNG
1 REPLICATES NOT ANALYZED			****	****			****	****		
2 MAGELONA SP	112	96			176				144	
3 PRIONOSPIO PINNATA	16				32				320	144
4 DIOPATRA CUPREA	128								128	
5 COROPHIUM ACHERUSICUM	96	16							16	128
6 MEDIOMASTUS CALIFORNIENSIS	80				16				128	
7 NEREIS SP	32	32							48	32
8 BATEA CARTHARINENSIS	32								96	
9 SPIOCHAETOPTERUS OCULATUS	32				80				16	
10 CEREBRATULUS LACTEUS	16	48							16	32
11 SPIOPHANES BOMBYX	16				48				32	
12 LUMBRINERIS TENUIS	16	64								
13 NEREIS SUCCINEA	16	16							16	32
14 NEMERTEA (YELLOW BANDED)	16				16	16			16	
15 BUNODACTIS TEXENSIS		32							16	
16 BRANCHIOSTOMA CARIBAEUM		32								16
17 PSEUDEURYTHOE AMBIGUA										48
18 PRIONOSPIO CIRRIFERA	16									16
19 ABRA AEQUALIS						32				
20 AMPELISCA ABDITA	16									
21 ANCISTROSYLLIS JONESI		16								
22 CLYMENELLA ZONALIS		16								
23 HEMIPHOLIS ELONGATA	16									
24 NASSARIUS ACUTUS	16									
25 SIGAMBRA TENTACULATA		16								
26 SIGAMBRA WASSI		16								
27 ANACHIS OBESA	16									
28 MALACOCEROS SP	16									
29 ANEMONE UN ID		16								
30 SCOLOPLOS (LEODAMUS) RUBRA	16									
31 GLYCINDE SOLITARIA										16
32 NOTOMASTUS LATERICEUS									16	
33 PAGURUS ANNULIPES									16	
34 NEOPANOPE TEXANA									16	
35 LISTRIELLA SP									16	
TOTAL NUMBER OF INDIVIDUALS	720	416			368	48			1056	464

TABLE E84
EXPERIMENTAL STUDY BENTHIC DATA: POST-DISPOSAL PHASE SAMPLES.
NUMBER OF INDIVIDUALS/SQ.M. OF EACH SPECIES COLLECTED AT STATION 15-3 ON 23 JAN 76

SURF TEMP	SURF SAL	BOT TEMP	BOT SAL	DEPTH	SED TEMP	TIME ON	TIME OFF
13.0	26.0	13.5	27.0	8.0	14.0	920	945

SEDIMENTS: HARD SAND. 1 AND 4 NEARLY PURE SAND; 2, 3, 5 WITH SOME SOFT BLACK MUD.

SPECIES	REPLICATES									
	1		2		3		4		5	
	ADLT	YNG	ADLT	YNG	ADLT	YNG	ADLT	YNG	ADLT	YNG
1 REPLICATES NOT ANALYZED			****	****			****	****		
2 ABRA AEQUALIS		672				48				
3 PRIONOSPIO PINNATA	48	16			16				288	16
4 MEDIOMASTUS CALIFORNIENSIS	224				48	16			32	
5 SPIOPHANES BOMBYX	208	48			16				32	
6 MAGELONA SP	32				128	16			32	
7 MULINIA LATERALIS		192								
8 NEREIS SP					80	64			48	
9 NASSARIUS ACUTUS	16								160	
10 COROPHIUM ACHERUSICUM									144	16
11 CEREBRATULUS LACTEUS						48			16	32
12 OGYRIDES LIMICOLA					48	16			32	
13 ANAITIDES ERYTHROPHYLLUS		16				16			16	32
14 GLYCINDE SOLITARIA						16			64	
15 BRANCHIOSTOMA CARIBAEUM						16				64
16 DIOPATRA CUPREA	16								48	
17 SIGAMBRA WASSI									48	16
18 LUMBRINERIS TENUIS		16				16				16
19 NEMERTEA (YELLOW BANDED)	32								16	
20 PAGURUS ANNULIPES	16								16	
21 NOTOMASTUS LATERICEUS						32				
22 OWENIA FUSIFORMIS					16				16	
23 AMPHARETE (EYES)									16	16
24 BATEA CARTHARINENSIS									32	
25 AMPELISCA ABDITA	16									
26 ANADARA TRANSVERSA		16								
27 PHORONIS ARCHITECTA	16									
28 OXYUROSTYLIS SALINOI	16									
29 NATICA PUSILLA					16					
30 PINNIXA CRISTATA						16				
31 LEPIDONOTUS SUBLEVIS						16				
32 TELLINA VERSICOLOR						16				
33 AGLAOPHAMUS VERRILLI									16	
34 CLYMENELLA ZONALIS									16	
35 NEMERTEA (YELLOW & PURPLE)									16	
36 NUCULANA CONCENTRICA									16	
37 SPIOCHAETOPTERUS OCULATUS									16	
TOTAL NUMBER OF INDIVIDUALS	640	976			368	352			1136	208

TABLE E85
EXPERIMENTAL STUDY BENTHIC DATA: POST-DISPOSAL PHASE SAMPLES.
NUMBER OF INDIVIDUALS/SC.M. OF EACH SPECIES COLLECTED AT STATION 15-4 ON 23 JAN 76

SURF TEMP	SURF SAL	BOT TEMP	BOT SAL	DEPTH	SED TEMP	TIME ON	TIME OFF
13.5	26.0	13.0	28.0	8.0	13.0	1030	1045

SEDIMENTS: SANDY SILT.

SPECIES	REPLICATES									
	1		2		3		4		5	
	ADLT	YNG	ADLT	YNG	ADLT	YNG	ADLT	YNG	ADLT	YNG
1 REPLICATES NOT ANALYZED			****	****			****	****		
2 PRIONOSPIO PINNATA	1264	160			464	32			784	160
3 MAGELONA SP	128				112				144	
4 GLYCINDE SOLITARIA	64	48			32	16			32	
5 MEDIOMASTUS CALIFORNIENSIS	128				16				32	
6 NEREIS SP	32	16			32				48	48
7 PSEUDEURYTHOE AMBIGUA		32			16	32				64
8 CEREBRATULUS LACTEUS	16								32	
9 DIOPATRA CUPREA	48									
10 LUMBRINERIS TENUIS		32				16				
11 SIGAMBRA TENTACULATA		32								16
12 ABRA AEQUALIS		32								
13 NASSARIUS ACUTUS	16								16	
14 MULINIA LATERALIS										32
15 ANCISTROSYLLIS JONESI						32				
16 NINOE NIGRIPES	16									
17 NUCULANA CONCENTRICA	16									
18 NEMATODA	16									
19 SIGAMBRA WASSI										16
20 SPIOPHANES BOMBYX									16	
21 ANAITIDES ERYTHROPHYLLUS										16
22 TELLINA VERSICOLOR									16	
23 LOIMIA VIRIDIS									16	
24 NEMERTEA (YELLOW BANDED)	16									
TOTAL NUMBER OF INDIVIDUALS	1760	352			672	128			1136	352

AD-A061 844 ARMY ENGINEER WATERWAYS EXPERIMENT STATION VICKSBURG MISS F/G 13/3
AQUATIC DISPOSAL FIELD INVESTIGATIONS GALVESTON, TEXAS, OFFSHOR--ETC(U)
MAY 78 T D WRIGHT, D B MATHIS, J M BRANNON
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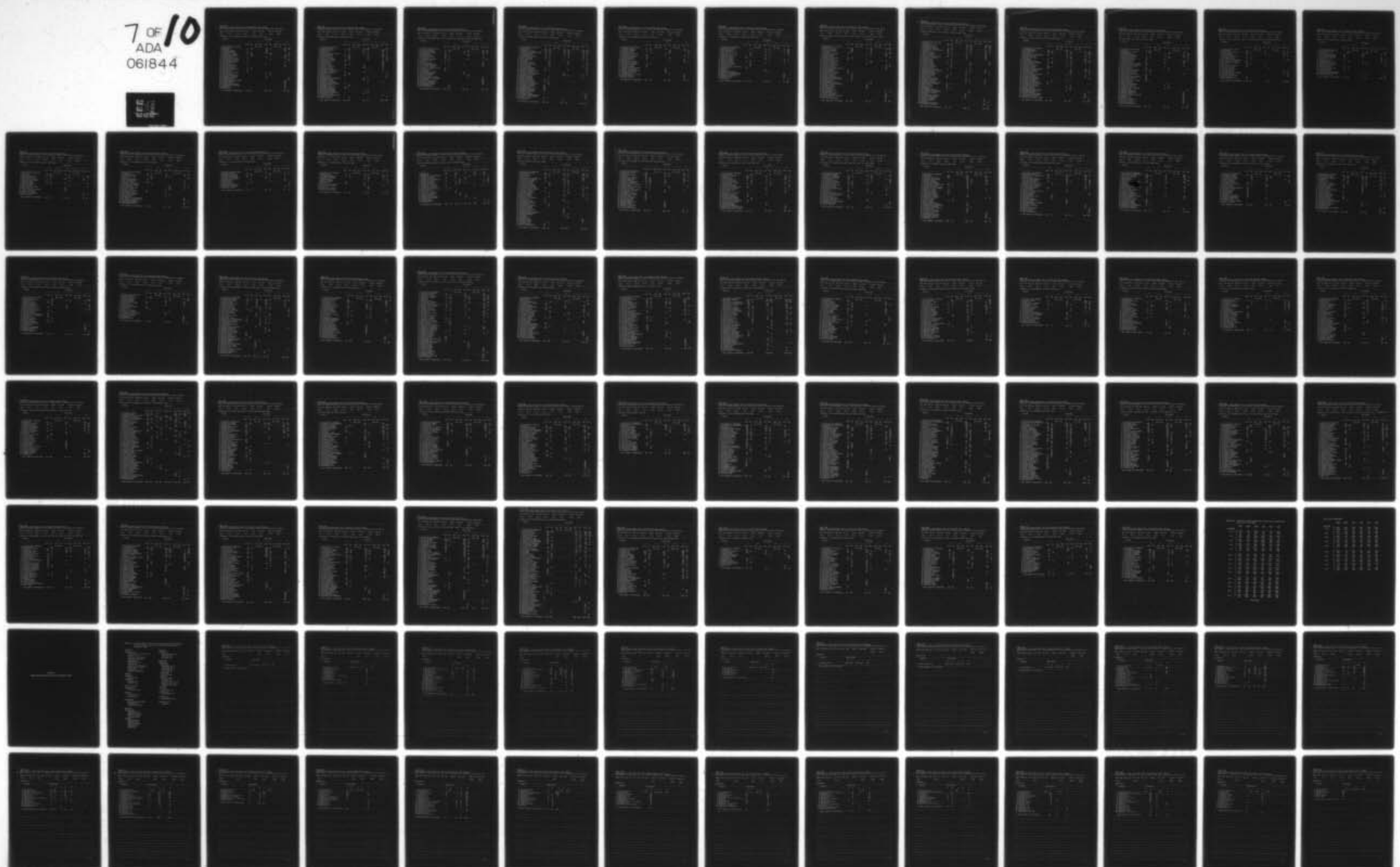

TABLE E86
EXPERIMENTAL STUDY BENTHIC DATA: POST-DISPOSAL PHASE SAMPLES.
NUMBER OF INDIVIDUALS/SQ.M. OF EACH SPECIES COLLECTED AT STATION 15-5 ON 23 JAN 76

SURF TEMP	SURF SAL	BOT TEMP	BOT SAL	DEPTH	SED TEMP	TIME ON	TIME OFF
13.0	25.0	13.0	28.0	8.0	13.0	1007	1022

SEDIMENTS: 2 MM OXIDIZED MUD OVER 2-3 CM SAND OVER GRAY CLAY.

SPECIES	REPLICATES									
	1		2		3		4		5	
	ADLT	YNG	ADLT	YNG	ADLT	YNG	ADLT	YNG	ADLT	YNG
1 REPLICATES NOT ANALYZED			****	****			****	****		
2 MAGELONA SP		64			16				432	160
3 NEREIS SP	16	64			48	16			64	80
4 NASSARIUS ACUTUS					16				160	
5 DIOPATRA CUPREA	16				96					
6 LUMBRINERIS TENUIS		16			16	48				32
7 PRIONOSPIO PINNATA	16	32				16			16	16
8 CEREBRATULUS LACTEUS		16							32	32
9 ANACHIS OBESA					64				16	
10 PHORONIS ARCHITECTA	16								48	
11 NOTOMASTUS LATERICEUS						32				16
12 PSEUDEURYTHOE AMBIGUA										48
13 OWENIA FUSIFORMIS	16								16	
14 ARICIDEA SP					32					
15 TEREBRA PROTEXTA									32	
16 THALASSEMA HARTMANI									32	
17 NEREIS SUCCINEA	16									
18 SIGAMBRA TENTACULATA		16								
19 MICROPHOLIS ATRA	16									
20 AMATHIA SP.	16									
21 ANCISTROSYLLIS JONESI						16				
22 NINOE NIGRIPES					16					
23 NUCULANA CONCENTRICA						16				
24 HEMIPHOLIS ELONGATA					16					
25 CLYMENELLA ZONALIS										16
26 SIGAMBRA WASSI										16
27 CHAETOPTERUS VARIOPEDATUS									16	
28 PARAMYA SUBOVATA									16	
29 PINNIXA LUNZI									16	
30 COROPHIUM ACHERUSICUM									16	
31 TEINOSTOMIA BISCAYENSE									16	
32 POLYNOIDAE									16	
33 ARABELLA SP.									16	
TOTAL NUMBER OF INDIVIDUALS	128	208			320	144			960	416

TABLE E87
EXPERIMENTAL STUDY BENTHIC DATA: POST-DISPOSAL PHASE SAMPLES.
NUMBER OF INDIVIDUALS/SQ.M. OF EACH SPECIES COLLECTED AT STATION 14-1 ON 21 JAN 76

SURF TEMP	SURF SAL	BOT TEMP	BOT SAL	DEPTH	SED TEMP	TIME ON	TIME OFF
12.5	25.0	12.5	26.0	18.0	12.5	1315	1340

SEDIMENTS: SANDY-SHELL HASH AND BEAUMONT CLAY.

SPECIES	REPLICATES									
	1		2		3		4		5	
	ADLT	YNG	ADLT	YNG	ADLT	YNG	ADLT	YNG	ADLT	YNG
1 REPLICATES NOT ANALYZED			****	****			****	****		
2 PINNIXA CRISTATA		32			16	80				320
3 LUMBRINERIS TENUIS	16	112			32	128			80	64
4 BALANOGLOSSUS					112				320	
5 MAGELONA SP		16				96			128	32
6 MESOCHAETOPTERUS TAYLORI	16				256					
7 LEPIDASTHENIA SP		16				48			160	16
8 AMPELISCA ABDITA	64	144							16	
9 NEREIS SUCCINEA		64				64			32	48
10 TELLINA VERSICOLOR		80				32				80
11 CEREBRATULUS LACTEUS	32	32							32	32
12 PAGURUS ANNULIPES	80								32	
13 LISTRIELLA SP									96	
14 NINOE NIGRIPES	16	32							32	
15 DIOPATRA CUPREA	16				32				16	
16 PHORONIS ARCHITECTA					48				16	
17 NEMERTEA (WHITE)	16				16				16	
18 SPIOPHANES BOMBYX						48				
19 AMPHIPODA, LONG 6TH LEG									48	
20 COROPHIUM ACHERUSICUM	32				16					
21 GLYCERA AMERICANA		16								16
22 NEREIS SP	16	16								
23 SIGAMBRA WASSI	16									16
24 COSSURA DELTA						16				16
25 MEDIOMASTUS CALIFORNIENSIS					32					
26 NASSARIUS ACUTUS					32					
27 PRIONOSPIO PINNATA						32				
28 CRASSINELLA LUNULATA									32	
29 NEMERTEA (YELLOW BANDED)	16									
30 SIGAMBRA TENTACULATA		16								
31 MAGELONA ROSEA		16								
32 PALEONOTUS HETEROSETA	16									
33 LATREUTES PARVULUS	16									
34 AGLAOPHAMUS VERRILLI						16				
35 NOTOMASTUS HEMIPODUS					16					
36 BRANCHIOSTOMA CARIBAEUM						16				
37 PANOPEUS TURGIDUS					16					
38 SPIOCHAETOPTERUS OCULATUS									16	
39 CERATOCEPHALE SP.										16
40 THARYX SETIGERA		16								
TOTAL NUMBER OF INDIVIDUALS	368	608			624	576			1072	656

TABLE E88
EXPERIMENTAL STUDY BENTHIC DATA: POST-DISPOSAL PHASE SAMPLES.
NUMBER OF INDIVIDUALS/SQ.M. OF EACH SPECIES COLLECTED AT STATION 14-2 ON 21 JAN 76

SURF TEMP	SURF SAL	BOT TEMP	BOT SAL	DEPTH	SED TEMP	TIME ON	TIME OFF
13.0	25.0	12.5	26.0	18.0	13.0	1350	1415

SEDIMENTS: 1 CM OXIDIZED MUD OVER GRAY CLAY WITH SHELL HASH AND MUCH BEAUMONT CLAY

SPECIES	REPLICATES									
	1		2		3		4		5	
	ADLT	YNG	ADLT	YNG	ADLT	YNG	ADLT	YNG	ADLT	YNG
1 REPLICATES NOT ANALYZED			****	****			****	****		
2 AMPELISCA ABDITA	64	64				16			32	16
3 LUMBRINERIS TENUIS		32			32	32			48	16
4 NUCULANA CONCENTRICA	32				48				32	16
5 MAGELONA SP	64					16				
6 NINOE NIGRIPES	16					48			16	
7 PRIONOSPIO PINNATA	48	32								
8 LISTRIELLA SP	48								16	
9 CEREBRATULUS LACTEUS		16				16				16
10 DIOPATRA CUPREA	48									
11 NEREIS SP		32							16	
12 ARMANDIA AGILIS	32								16	
13 CORBULA BARRATTANIA					16				16	
14 TEINOSTOMIA BISCAYENSE									32	
15 CALLINECTES SIMILIS		16								
16 CLYMENELLA TORQUATA CALIDA	16									
17 NEPHTYS PICTA	16									
18 TANAIDACEA	16									
19 ANCISTROSYLLIS JONESI					16					
20 TELLINA VERSICOLOR					16					
21 ASYCHIS ELONGATA						16				
22 STHENELAIS BOA						16				
23 NEMERTEA (YELLOW BANDED)									16	
24 ASPIDOSIPHON CF SPECIOSUS									16	
25 GIANT SPERM									16	
26 VITRINELLA HELICOIDEA									16	
27 NAINERIS LAEVIGATA									16	
28 SPIOCARCINUS LOBATUS									16	
29 CERATOCEPHALE SP.		16								
30 THARYX SETIGERA		16								
TOTAL NUMBER OF INDIVIDUALS	400	224			128	160			320	64

TABLE E89
EXPERIMENTAL STUDY BENTHIC DATA: POST-DISPOSAL PHASE SAMPLES.
NUMBER OF INDIVIDUALS/SQ.M. OF EACH SPECIES COLLECTED AT STATION 14-3 ON 21 JAN 76

SURF TEMP	SURF SAL	BOT TEMP	BOT SAL	DEPTH	SED TEMP	TIME ON	TIME OFF
13.0	25.5	12.5	27.0	16.0	12.5	1425	1450

SEDIMENTS: SAND AND SHELL HASH, SOME BEAUMONT CLAY.

SPECIES	REPLICATES									
	1		2		3		4		5	
	ADLT	YNG	ADLT	YNG	ADLT	YNG	ADLT	YNG	ADLT	YNG
1 REPLICATES NOT ANALYZED			****	****			****	****		
2 BALANOGLOSSUS	224	16			80	448			16	48
3 MAGELONA SP	64	80			80	16			80	160
4 LUMBRINERIS TENUIS	128	80			16	80			16	112
5 MEDIOMASTUS CALIFORNIENSIS	64				48	16			16	
6 PINNIXA CRISTATA		48				48				48
7 LEPIDASTHENIA SP	48	16			16				16	
8 CEREBRATULUS LACTEUS	16					16			32	16
9 NEREIS SUCCINEA	16	64								
10 AMPELISCA ABDITA					32				16	32
11 ABRA AEQUALIS		16				48				
12 NEREIS SP		32				16				16
13 PRIONOSPIO PINNATA		16				16				32
14 AGLAOPHAMUS VERRILLI		32							16	
15 SIGAMBRA WASSI		16								32
16 NINOE NIGRIPES										48
17 SIGAMBRA TENTACULATA	16					16				
18 TELLINA VERSICOLOR		16								16
19 AMPHIPODA, LONG 6TH LEG	32									
20 CLYMENELLA ZONALIS					16					16
21 NEMERTEA (YELLOW BANDED)					16				16	
22 OXYUROSTYLIS SALINOI					16	16				
23 ARMANDIA AGILIS									32	
24 GLYCERA AMERICANA		16								
25 PAGURUS ANNULIPES	16									
26 NEMERTEA (WHITE)		16								
27 AMPHARETE ACUTIFRONS	16									
28 HEPATUS EPHELITICUS		16								
29 BRANCHIOSTOMA CARIBAEUM		16								
30 LEPIDONOTUS SUBLEVIS	16									
31 AMPHIPODA (RED EYES)	16									
32 PINNOTHERIDAE A	16									
33 PALEONOTUS HETEROSETA	16									
34 PRIONOSPIO CIRRIFERA	16									
35 PHORONIS ARCHITECTA									16	
36 STHENELAIS BOA										16
37 SPIOPHANES BOMBYX										16
38 PRIONOSPIO HETEROBRANCHIA										16
39 ANAITIDES ERYTHROPHYLLUS										16
40 THARYX SETIGERA	16									
41 LISTRIELLA SP					16					
TOTAL NUMBER OF INDIVIDUALS	736	496			336	736			272	640

TABLE E90
EXPERIMENTAL STUDY BENTHIC DATA: POST-DISPOSAL PHASE SAMPLES.
NUMBER OF INDIVIDUALS/SQ.M. OF EACH SPECIES COLLECTED AT STATION 14-4 ON 21 JAN 76

SURF TEMP	SURF SAL	BOT TEMP	BOT SAL	DEPTH	SED TEMP	TIME ON	TIME OFF
13.0	25.0	13.0	27.0	17.0	13.0	1455	1520

SEDIMENTS: 1 CM OXIDIZED MUD OVER MUDDY GRAY CLAY.

SPECIES	REPLICATES									
	1		2		3		4		5	
	ADLT	YNG	ADLT	YNG	ADLT	YNG	ADLT	YNG	ADLT	YNG
1 REPLICATES NOT ANALYZED			****	****			****	****		
2 DIOPATRA CUPREA	80	16			48				48	
3 LUMBRINERIS TENUIS		32				32			16	32
4 AMPELISCA ABDITA	32					32				16
5 NINOE NIGRIPES		48				16				16
6 VITRINELLA HELICOIDEA					80					
7 AMPHIPODA, UN ID	48								16	
8 CEREBRATULUS LACTEUS	16									16
9 LEPIDASTHENIA SP	16					16				
10 ASYCHIS ELONGATA	16								16	
11 MAGELONA SP						16			16	
12 NUCULANA CONCENTRICA									16	16
13 ANCISTROSYLLIS JONESI		16								
14 HEMIPHOLIS ELONGATA	16									
15 NEOPANOPE TEXANA	16									
16 NEMERTEA (WHITE)	16									
17 NEMERTEA (YELLOW BANDED)					16					
18 PHORONIS ARCHITECTA					16					
19 ANEMONE (SAND ENCRUSTED)					16					
20 BUNODACTIS TEXENSIS					16					
21 STHENELAIS BOA						16				
22 SPIOCHAETOPTERUS OCULATUS									16	
23 NEPHTYS INCISA									16	
24 POLYDORA SOCIALIS									16	
TOTAL NUMBER OF INDIVIDUALS	256	112			192	128			176	96

TABLE E91
EXPERIMENTAL STUDY BENTHIC DATA: POST-DISPOSAL PHASE SAMPLES.
NUMBER OF INDIVIDUALS/SQ.M. OF EACH SPECIES COLLECTED AT STATION 14-5 ON 21 JAN 76

SURF TEMP	SURF SAL	BOT TEMP	BOT SAL	DEPTH	SED TEMP	TIME ON	TIME OFF
13.0	26.0	12.5	26.0	17.0	12.0	1530	1550

SEDIMENTS: 1 CM OXIDIZED SILT OVER MUDDY GRAY CLAY.

SPECIES	REPLICATES									
	1		2		3		4		5	
	ADLT	YNG	ADLT	YNG	ADLT	YNG	ADLT	YNG	ADLT	YNG
1 REPLICATES NOT ANALYZED			****	****			****	****		
2 LUMBRINERIS TENUIS		32			16	32			64	48
3 ARMANDIA AGILIS										144
4 NINOE NIGRIPES					16	64			16	16
5 CEREBRATULUS LACTEUS		16								48
6 MAGELONA SP		16			16					32
7 NUCULANA CONCENTRICA		16			32	16				
8 SIGAMBRA WASSI	64									
9 NEMERTEA (WHITE)	32				16					
10 NEREIS SUCCINEA					16				16	16
11 AMPELISCA ABDITA		16				16				
12 DIOPATRA CUPREA	16								16	
13 ASYCHIS ELONGATA		16			16					
14 CLYMENELLA ZONALIS		16								
15 BALANOGLOSSUS		16								
16 MEDIOMASTUS CALIFORNIENSIS	16									
17 EDWARDSIA SP	16									
18 NEREIS SP					16					
19 NEMATODA					16					
20 NAINERIS LAEVIGATA						16				
21 NEMERTEA (YELLOW BANDED)									16	
22 ANEMONE (SAND ENCRUSTED)									16	
23 BUNODACTIS TEXENSIS									16	
24 MAGELONA ROSEA									16	
25 ARICIDEA SP										16
TOTAL NUMBER OF INDIVIDUALS	144	144			160	144			176	320

TABLE E92
EXPERIMENTAL STUDY BENTHIC DATA: POST-DISPOSAL PHASE SAMPLES.
NUMBER OF INDIVIDUALS/SQ.M. OF EACH SPECIES COLLECTED AT STATION 12-1 ON 21 JAN 76

SURF TEMP	SURF SAL	BOT TEMP	BOT SAL	DEPTH	SED TEMP	TIME ON	TIME OFF
11.5	25.0	11.5	24.0	12.0	11.5	830	955

SEDIMENTS: MUDDY GRAY CLAY WITH SOME SAND, BEAUMONT CLAY, AND LOT OF SHELL HASH.

SPECIES	REPLICATES									
	1		2		3		4		5	
	ADLT	YNG	ADLT	YNG	ADLT	YNG	ADLT	YNG	ADLT	YNG
1 REPLICATES NOT ANALYZED			****	****			****	****		
2 MAGELONA SP	32	16			80	32			16	224
3 PRIONOSPIO PINNATA		112				16			64	176
4 AMPELISCA ABDITA		192				16				
5 LUMBRINERIS TENUIS		112				16				16
6 NEREIS SP	16								32	64
7 NUCULANA CONCENTRICA					32	16			48	
8 SIGAMBRA WASSI									48	
9 STHENELAIS BOA										48
10 SIGAMBRA TENTACULATA	16	16								
11 NEMERTEA (WHITE)	16				16					
12 ANCISTROSYLLIS JONESI						16			16	
13 PINNIXA CRISTATA						32				
14 CORBULA BARRATTANIA					32					
15 CEREBRATULUS LACTEUS									16	16
16 CLYMENELLA ZONALIS									16	16
17 DIOPATRA CUPREA									32	
18 MEDIOMASTUS CALIFORNIENSIS									32	
19 GLYCERA AMERICANA	16									
20 NINOE NIGRIPES	16									
21 NOTOMASTUS LATERICEUS		16								
22 PHORONIS ARCHITECTA	16									
23 LUCINA AMIANTIS		16								
24 MULINIA LATERALIS		16								
25 ANAITIDES ERYTHROPHYLLUS		16								
26 TURBELLARIA, BLACK SPOTS	16									
27 TELLINA LINEATA		16								
28 COSSURA DELTA						16				
29 PSEUDEURYTHOE AMBIGUA						16				
30 MAGELONA (SERRATE PROSTOM)					16					
31 NEPHTYS INCISA					16					
32 AMPHARETE (EYES)					16					
33 CERATOCEPHALE SP.					16					
34 ABRA AEQUALIS										16
35 GLYCINDE SOLITARIA									16	
36 BALANOGLOSSUS										16
37 HEMIPHOLIS ELONGATA									16	
38 PAGURUS ANNULIPES									16	
39 SPIOCHAETOPTERUS OCULATUS									16	
40 ARMANDIA AGILIS									16	
41 COROPHIUM ACHERUSICUM									16	
TOTAL NUMBER OF INDIVIDUALS	144	528			224	176			416	592

TABLE E93
EXPERIMENTAL STUDY BENTHIC DATA: POST-DISPOSAL PHASE SAMPLES.
NUMBER OF INDIVIDUALS/SQ.M. OF EACH SPECIES COLLECTED AT STATION 12-2 ON 21 JAN 76

SURF TEMP	SURF SAL	BOT TEMP	BOT SAL	DEPTH	SED TEMP	TIME ON	TIME OFF
12.0	25.0	12.0	26.0	12.0	12.0	1000	1025

SEDIMENTS: SANDY GRAY CLAY, SOME SHELL HASH, BEAUMONT CLAY

SPECIES	REPLICATES									
	1		2		3		4		5	
	ADLT	YNG	ADLT	YNG	ADLT	YNG	ADLT	YNG	ADLT	YNG
1 REPLICATES NOT ANALYZED			****	****			****	****		
2 MAGELONA SP	64	160			16	224			96	160
3 PRIONOSPIO PINNATA	48	32			16	48			64	336
4 SIGAMBRA WASSI					96	16			256	32
5 LUMBRINERIS TENUIS	16	208			16	80				32
6 CEREBRATULUS LACTEUS	16	48				160			16	32
7 MEDIOMASTUS CALIFORNIENSIS	96				80				48	
8 NEREIS SP	16	96				48			16	16
9 DIOPATRA CUPREA	80				48				16	
10 NINOE NIGRIPES		64			32	16			32	
11 AMPELISCA ABDITA	48	16							64	
12 NEMERTEA (YELLOW BANDED)	48				16				48	
13 HEMIPHOLIS ELONGATA					96				16	
14 ABRA AEQUALIS		96								
15 BALANOGLOSSUS	32									64
16 STHENELAIS BOA		32				16				32
17 COSSURA DELTA	16					16				16
18 NEREIS SUCCINEA		32				16				
19 PINNIXA CRISTATA		48								
20 TELLINA VERSICOLOR		16				32				
21 ARMANDIA AGILIS	16				16				16	
22 ANCISTROSYLLIS JONESI						32			16	
23 SPIOCHAETOPTERUS OCULATUS					16	16			16	
24 AMPHARETE (EYES)					16					32
25 AGLAOPHAMUS VERRILLI		32								
26 LEPIDASTHENIA SP	16				16					
27 OWENIA FUSIFORMIS	32									
28 GIANT SPERM	16				16					
29 NUCULANA CONCENTRICA					16				16	
30 SIGAMBRA TENTACULATA						16			16	
31 PILARGIS PACIFICA					32					
32 ANCISTROSYLLIS HARTMANAE									32	
33 NOTOMASTUS LATERICEUS	16	16								
34 NEPHTYS PICTA	16									
35 MAGELONA ROSEA	16									
36 ARICIDEA SP		16								
37 POLYGORDIUS SP.	16									
38 CALLIANASSA LATISPINA						16				
39 CALLIANASSA ACANTHOCHIRUS						16				
40 LEPIDONOTUS SUBLEVIS					16					
41 MYTILIDAE					16					
42 POECILOCHAETUS JOHNSONI					16					
43 PALEONOTUS HETEROSETA					16					
44 GLYCINDE SOLITARIA									16	
45 PHASCOLION STROMBI									16	
46 ASYCHIS ELONGATA										16
47 NEMATODA									16	
48 COROPHIUM ACHERUSICUM									16	
49 PRIONOSPIO CIRRIFERA										16
TOTAL NUMBER OF INDIVIDUALS	624	912			608	768			848	784

TABLE E94
EXPERIMENTAL STUDY BENTHIC DATA: POST-DISPOSAL PHASE SAMPLES.
NUMBER OF INDIVIDUALS/SQ.M. OF EACH SPECIES COLLECTED AT STATION 12-3 ON 22 JAN 76

SURF TEMP	SURF SAL	BOT TEMP	BOT SAL	DEPTH	SED TEMP	TIME ON	TIME OFF
12.5	25.0	12.5	28.0	11.0	13.0	915	945

SEDIMENTS: 1 TO 2 CM OXIDIZED SILT OVER GRAY CLAY.

SPECIES	REPLICATES									
	1		2		3		4		5	
	ADLT	YNG	ADLT	YNG	ADLT	YNG	ADLT	YNG	ADLT	YNG
1 REPLICATES NOT ANALYZED			****	****			****	****		
2 POLYGORDIUS SP.	40				1010					
3 SPIOPHANES BOMBYX	90	30			80	60			210	190
4 ABRA AEQUALIS	10	80				60				110
5 NEREIS SP					30	30			40	70
6 MEDIOMASTUS CALIFORNIENSIS	10				60				80	
7 POLYDORA SOCIALIS						140				10
8 PAGURUS ANNULIPES		10			90	10			10	
9 NEMATODA									120	
10 MAGELONA SP	10					10			60	20
11 LUMBRINERIS TENUIS		40				20				20
12 BRANCHIOSTOMA CARIBAEUM	10	20			40				10	
13 GYPTIS VITTATA						80				
14 PHORONIS ARCHITECTA	20				50					
15 AMPELISCA ABDITA	20	20				20				
16 AMPHARETE (EYES)	20								30	10
17 PRIONOSPIO HETEROBRANCHIA						10			40	
18 PRIONOSPIO PINNATA						10			20	10
19 THALASSEMA HARTMANI						30				10
20 SIGAMBRA WASSI	10					20				
21 NEMERTEA (YELLOW BANDED)					10				20	
22 MYSELLA PLANULATA									30	
23 TELLINA VERSICOLOR										30
24 PRIONOSPIO CIRRIFERA						20				
25 ELECTRA SP (COLONIES)					20					
26 GLYCERA AMERICANA		10								
27 AMPHARETE ACUTIFRONS	10									
28 SPIOCHAETOPTERUS OCULATUS	10									
29 CEREBRATULUS LACTEUS						10				
30 NOTOMASTUS LATERICEUS					10					
31 PINNIXA CRISTATA						10				
32 ARMANDIA AGILIS						10				
33 ELECTRA CRUSTULENTA (COL)					10					
34 AGLAOPHAMUS VERRILLI										10
35 DIOPATRA CUPREA									10	
36 ANAITIDES ERYTHROPHYLLUS									10	
37 LEPTOCHELA SERRATORBITA									10	
38 OXYUROSTYLIS SALINOI									10	
39 SCOLOPLOS (LEODAMUS) RUBRA										10
TOTAL NUMBER OF INDIVIDUALS	260	210			1410	550			800	500

TABLE E95
EXPERIMENTAL STUDY BENTHIC DATA: POST-DISPOSAL PHASE SAMPLES.
NUMBER OF INDIVIDUALS/SQ.M. OF EACH SPECIES COLLECTED AT STATION 12-4 ON 21 JAN 76

SURF TEMP	SURF SAL	BOT TEMP	BOT SAL	DEPTH	SED TEMP	TIME ON	TIME OFF
12.5	25.0	12.0	26.0	11.0	12.0	1126	1210

SEDIMENTS: SANDY CLAY MIXED WITH SHELL HASH.

SPECIES	REPLICATES									
	1		2		3		4		5	
	ADLT	YNG	ADLT	YNG	ADLT	YNG	ADLT	YNG	ADLT	YNG
1 REPLICATES NOT ANALYZED			****	****			****	****		
2 NEREIS SP	48	208							16	
3 CEREBRATULUS LACTEUS		208				16				16
4 MAGELONA SP					32	16			96	64
5 AMPELISCA ABDITA									64	80
6 NUCULANA CONCENTRICA	16				48	16			48	
7 LUMBRINERIS TENUIS		48				16				48
8 PAGURUS ANNULIPES	80				32					
9 PRIONOSPIO PINNATA									48	48
10 SIGAMBRA WASSI	16				16				48	
11 DIOPATRA CUPREA	32				16				32	
12 MEDIOMASTUS CALIFORNIENSIS	64									
13 SPIOCHAETOPTERUS OCULATUS	32								32	
14 VITRINELLA HELICOIDEA					64					
15 NINOE NIGRIPES	16					16				16
16 NEREIS SUCCINEA	16					16				
17 BRANCHIOSTOMA CARIBAEUM	16	16								
18 PRIONOSPIO CIRRIFERA		32								
19 PHASCOLION STROMBI									32	
20 VARICORBULA OPERCULATA	16									
21 NEPHTYS PICTA	16									
22 CALLIANASSA ACANTHOCHIRUS	16									
23 LEPIDONOTUS SUBLEVIS	16									
24 POLYGORDIUS SP.	16									
25 ELECTRA CRUSTULENTA (COL)	16									
26 GYPTIS VITTATA		16								
27 PINNIXA CRISTATA						16				
28 TURBONILLA INTERRUPTA					16					
29 MICROPHOLIS ATRA						16				
30 PARANTHUS RAPIFORMIS						16				
31 CLYMENELLA SP., FRAGMENT					16					
32 COSSURA DELTA										16
33 PHORONIS ARCHITECTA									16	
34 SIGAMBRA TENTACULATA									16	
35 NEMERTEA (WHITE)									16	
36 CLYMENELLA TORQUATA CALIDA									16	
37 MAGELONA ROSEA									16	
38 NEMATODA									16	
39 ARMANDIA AGILIS									16	
40 PALEONOTUS HETEROSETA									16	
41 AMPHARETE (EYES)									16	
42 PILARGIS PACIFICA									16	
43 BATEA CATHARINENSIS										16
TOTAL NUMBER OF INDIVIDUALS	432	528			240	144			576	304

TABLE E36
EXPERIMENTAL STUDY BENTHIC DATA: POST-DISPOSAL PHASE SAMPLES.
NUMBER OF INDIVIDUALS/SQ.M. OF EACH SPECIES COLLECTED AT STATION 12-5 ON 21 JAN 76

SURF TEMP	SURF SAL	BOT TEMP	BOT SAL	DEPTH	SED TEMP	TIME ON	TIME OFF
12.0	25.0	12.0	26.0	13.0	12.0	1245	1305

SEDIMENTS: 1 CM OXIDIZED MUD OVER 5 CM SANDY MUD AND SHELL HASH OVER SANDY CLAY.

SPECIES	REPLICATES									
	1		2		3		4		5	
	ADLT	YNG	ADLT	YNG	ADLT	YNG	ADLT	YNG	ADLT	YNG
1 REPLICATES NOT ANALYZED			****	****			****	****		
2 MAGELONA SP	160				16				16	48
3 CEREBRATULUS LACTEUS	16	32							16	16
4 SIGAMBRA WASSI	48				16				16	
5 NINOE NIGRIPES	32					16				16
6 NUCULANA CONCENTRICA		32							32	
7 DIOPATRA CUPREA	48									
8 LUMBRINERIS TENUIS		32								16
9 MEDIOMASTUS CALIFORNIENSIS	32								16	
10 ANCISTROSYLLIS JONESI	32									
11 NEMERTEA (YELLOW BANDED)	32									
12 NEREIS SP	16	16								
13 VITRINELLA HELICOIDEA	16				16					
14 PRIONOSPIO PINNATA	16									
15 NEMERTEA (WHITE)						16				
16 GLYCINDE SOLITARIA										16
17 LEPIDASTHENIA SP									16	
18 MICROPHOLIS ATRA										16
19 CALLIANASSA ACANTHOCHIRUS									16	
20 ASYCHIS ELONGATA										16
21 COROPHIUM ACHERUSICUM										16
22 LISTRIELLA SP	16									
23 BATEA CARTHARINENSIS	16									
TOTAL NUMBER OF INDIVIDUALS	480	112			48	32			128	160

TABLE E97
EXPERIMENTAL STUDY BENTHIC DATA: POST-DISPOSAL PHASE SAMPLES.
NUMBER OF INDIVIDUALS/SQ.M. OF EACH SPECIES COLLECTED AT STATION 27-1 ON 22 JAN 76

SURF TEMP	SURF SAL	BOT TEMP	BOT SAL	DEPTH	SED TEMP	TIME ON	TIME OFF
14.0	26.0	14.0	28.0	13.0	14.0	1201	1225

SEDIMENTS: 2 CM OXIDIZED SILT OVER GRAY CLAY.

SPECIES	REPLICATES									
	1		2		3		4		5	
	ADLT	YNG	ADLT	YNG	ADLT	YNG	ADLT	YNG	ADLT	YNG
1 REPLICATES NOT ANALYZED			****	****			****	****		
2 LUMBRINERIS TENUIS		528				80				16
3 MAGELONA SP		176			96	16				32
4 DIOPATRA CUPREA	64				96				80	
5 VITRINELLA HELICOIDEA	16				224					
6 NUCULANA CONCENTRICA	48				16				16	
7 CEREBRATULUS LACTEUS									64	
8 NEREIS SP									32	32
9 PRIONOSPIO PINNATA	16				16				16	
10 SIGAMBRA WASSI		32								16
11 SIGAMBRA TENTACULATA					32	16				
12 ANCISTROSYLLIS JONESI						16				16
13 GLYCINDE SOLITARIA	16									
14 NINOE NIGRIPES		16								
15 NOTOMASTUS LATERICEUS	16									
16 ASYCHIS ELONGATA		16								
17 NEPHTYS PICTA	16									
18 NEMERTEA (YELLOW BANDED)					16					
19 ANCISTROSYLLIS HARTMANAE						16				
20 CLYMENELLA ZONALIS										16
TOTAL NUMBER OF INDIVIDUALS	192	768			496	144			208	128

TABLE E98
EXPERIMENTAL STUDY BENTHIC DATA: POST-DISPOSAL PHASE SAMPLES.
NUMBER OF INDIVIDUALS/SQ.M. OF EACH SPECIES COLLECTED AT STATION 27-2 ON 22 JAN 76

SURF TEMP	SURF SAL	BOT TEMP	BOT SAL	DEPTH	SED TEMP	TIME ON	TIME OFF
14.0	27.0	13.5	28.0	13.0	14.0	1035	1100

SEDIMENTS: 1-2 CM OXIDIZED SILT OVER GRAY CLAY.

SPECIES	REPLICATES									
	1		2		3		4		5	
	ADLT	YNG	ADLT	YNG	ADLT	YNG	ADLT	YNG	ADLT	YNG
1 REPLICATES NOT ANALYZED			****	****			****	****		
2 MAGELONA SP	32	96			32	48				
3 NEREIS SP	16	144								16
4 LUMBRINERIS TENUIS		16				80				16
5 DIOPATRA CUPREA	16				32				48	
6 CEREBRATULUS LACTEUS		32			32				16	
7 NUCULANA CONCENTRICA	32					48				
8 SIGAMBRA WASSI		48								16
9 AMPELISCA ABDITA	16				16					
10 ASYCHIS ELONGATA		32								
11 NINOE NIGRIPES						16				16
12 ANCISTROSYLLIS JONESI					16					
13 NEPHTYS INCISA					16					
14 SPIOCHAETOPTERUS OCULATUS					16					
15 PAGURUS ANNULIPES					16					
16 HEMIPHOLIS ELONGATA									16	
17 SIGAMBRA TENTACULATA										16
18 ARMANDIA AGILIS									16	
TOTAL NUMBER OF INDIVIDUALS	112	368			176	192			96	80

TABLE E99
EXPERIMENTAL STUDY BENTHIC DATA: POST-DISPOSAL PHASE SAMPLES.
NUMBER OF INDIVIDUALS/SQ.M. OF EACH SPECIES COLLECTED AT STATION 27-3 ON 22 JAN 76

SURF TEMP	SURF SAL	BOT TEMP	BOT SAL	DEPTH	SED TEMP	TIME ON	TIME OFF
13.0	25.0	13.5	29.0	13.0	14.0	1005	1025

SEDIMENTS: 1-2 CM OXIDIZED SILT OVER GRAY CLAY.

SPECIES	REPLICATES									
	1		2		3		4		5	
	ADLT	YNG	ADLT	YNG	ADLT	YNG	ADLT	YNG	ADLT	YNG
1 REPLICATES NOT ANALYZED			****	****			****	****		
2 MAGELONA SP	16	48			16				96	112
3 DIOPATRA CUPREA	48				32				80	
4 LUMBRINERIS TENUIS		32			16	16				48
5 NEREIS SP		16								64
6 PAGURUS ANNULIPES	48	16								
7 NUCULANA CONCENTRICA									48	
8 AMPELISCA ABDITA	32									
9 NEMERTEA (WHITE)	16								16	
10 CALLIANASSA LATISPINA		32								
11 ANCISTROSYLLIS JONESI						16			16	
12 NINCE NIGRIPES						16				16
13 SIGAMBRA TENTACULATA						16			16	
14 SIGAMBRA WASSI					16	16				
15 HEMIPHOLIS ELONGATA	16									
16 AMPHIPODA, UN ID	16									
17 CEREBRATULUS LACTEUS					16					
18 TELLINA VERSICOLOR						16				
19 STHENELAIS BOA					16					
20 COSSURA DELTA									16	
21 MEDIOMASTUS CALIFORNIENSIS									16	
22 CALLIANASSA ACANTHOCHIRUS									16	
23 SPIOCARCINUS LOBATUS										16
24 COROPHIUM ACHERUSICUM									16	
25 FLABELLIGERIDAE SP									16	
TOTAL NUMBER OF INDIVIDUALS	192	144			112	96			352	256

TABLE E100
EXPERIMENTAL STUDY BENTHIC DATA: POST-DISPOSAL PHASE SAMPLES.
NUMBER OF INDIVIDUALS/SQ.M. OF EACH SPECIES COLLECTED AT STATION 27-4 ON 22 JAN 76

SURF TEMP	SURF SAL	BOT TEMP	BOT SAL	DEPTH	SED TEMP	TIME ON	TIME OFF
13.5	26.0	14.0	29.0	14.0	14.0	1140	1155

SEDIMENTS: 1-2 CM OXIDIZED SILT OVER GRAY CLAY.

SPECIES	REPLICATES									
	1		2		3		4		5	
	ADLT	YNG	ADLT	YNG	ADLT	YNG	ADLT	YNG	ADLT	YNG
1 REPLICATES NOT ANALYZED			****	****			****	****		
2 DIOPATRA CUPREA	48				64				64	
3 LUMBRINERIS TENUIS		48				16				16
4 NUCULANA CONCENTRICA	16	16				32			16	
5 SIGAMBRA TENTACULATA	32				32					
6 VITRINELLA HELICOIDEA					64					
7 SIGAMBRA WASSI		16							32	
8 MAGELONA SP						16			16	
9 NINOE NIGRIPES		16								
10 AMPHIPODA, UN ID	16									
11 ANCISTROSYLLIS JONESI										16
12 CLYMENELLA ZONALIS										16
13 AMPHARETE (EYES)									16	
TOTAL NUMBER OF INDIVIDUALS	112	96			160	64			144	48

TABLE E101
EXPERIMENTAL STUDY BENTHIC DATA: POST-DISPOSAL PHASE SAMPLES.
NUMBER OF INDIVIDUALS/SQ.M. OF EACH SPECIES COLLECTED AT STATION 27-5 ON 22 JAN 76

SURF TEMP	SURF SAL	BOT TEMP	BOT SAL	DEPTH	SED TEMP	TIME ON	TIME OFF
13.5	26.0	13.5	29.0	13.0	14.0	1105	1130

SEDIMENTS: 1-2 CM OXIDIZED SILT OVER GRAY CLAY.

SPECIES	REPLICATES									
	1		2		3		4		5	
	ADLT	YNG	ADLT	YNG	ADLT	YNG	ADLT	YNG	ADLT	YNG
1 REPLICATES NOT ANALYZED			****	****			****	****		
2 MAGELONA SP	32	16			16	128			16	48
3 DIOPATRA CUPREA	32				96				32	
4 NUCULANA CONCENTRICA		16				48			48	16
5 LUMBRINERIS TENUIS					16	80				
6 SIGAMBRA WASSI					16				32	16
7 ASYCHIS ELONGATA						48				
8 NINOE NIGRIPES	16									16
9 NEMATODA	16				16					
10 VITRINELLA HELICOIDEA					16				16	
11 CEREBRATULUS LACTEUS						16				
12 NEREIS SP						16				
13 SIGAMBRA TENTACULATA						16				
14 BASCANICHTHYS TERES										16
TOTAL NUMBER OF INDIVIDUALS	96	32			176	352			144	112

TABLE E102
EXPERIMENTAL STUDY BENTHIC DATA: POST-DISPOSAL PHASE SAMPLES.
NUMBER OF INDIVIDUALS/SQ.M. OF EACH SPECIES COLLECTED AT STATION 2-1 ON 31 MAR 76

SURF TEMP	SURF SAL	BOT TEMP	BOT SAL	DEPTH	SED TEMP	TIME ON	TIME OFF
20.0	22.0	19.0	28.0	9.0	19.0	1615	1645

SEDIMENTS: SANDY MUD AND SHELL HASH; LOTS OF BEAUMONT CLAY.

SPECIES	REPLICATES 1		2		3		4		5	
	ADLT	YNG	ADLT	YNG	ADLT	YNG	ADLT	YNG	ADLT	YNG
1 NEREIS SP	48		16		16		64		32	
2 MAGELONA SP	16		48				48		48	
3 MEDIOMASTUS CALIFORNIENSIS			16				48		48	
4 PAGURUS ANNULIPES						96				16
5 PRIONOSPIO PINNATA	32		16		48					
6 NEMERTEA (YELLOW BANDED)				16	16				32	32
7 SPIOPHANES BOMBYX	16			16						48
8 GLYCERA AMERICANA			16	32					16	16
9 MULINIA LATERALIS				16	16					16
10 CEREBRATULUS LACTEUS	16		16							
11 NOTOMASTUS LATERICEUS							16		16	
12 LUMBRINERIS TENUIS	16									
13 ANAITIDES ERYTHROPHYLLUS		16								
14 MONOCULODES SP	16									
15 AMPELISCA ABDITA			16							
16 ELECTRA SP (COLONIES)			16							
17 PAGURUS POLLICARIS				16						
18 NEMERTEA (WHITE)				16						
19 COROPHIUM ACHERUSICUM					16					
20 CRASSINELLA LUNULATA					16					
21 COSSURA DELTA							16			
22 MAGELONA RIOJAI									16	
23 NEPHTYS PICTA										16
TOTAL NUMBER OF INDIVIDUALS	160	16	160	112	128	96	192		208	144

TABLE E103
EXPERIMENTAL STUDY BENTHIC DATA: POST-DISPOSAL PHASE SAMPLES.
NUMBER OF INDIVIDUALS/SQ.M. OF EACH SPECIES COLLECTED AT STATION 2-2 ON 31 MAR 76

SURF TEMP	SURF SAL	BOT TEMP	BOT SAL	DEPTH	SED TEMP	TIME ON	TIME OFF
20.0	25.0	19.0	30.0	10.0	20.0	1540	1610

SEDIMENTS: SAND AND MUCH SHELL HASH.

SPECIES	REPLICATES 1		2		3		4		5	
	ADLT	YNG	ADLT	YNG	ADLT	YNG	ADLT	YNG	ADLT	YNG
1 REPLICATES NOT ANALYZED			****	****			****	****		
2 PRIONOSPIO PINNATA	160	16			512	192			160	128
3 MAGELONA SP	512				128				224	
4 BALANOGLOSSUS		96				240				240
5 NEREIS SP	144				48				112	
6 MEDIOMASTUS CALIFORNIENSIS	64				96				128	
7 PSEUDEURYTHOE AMBIGUA					64	16			32	
8 LUMBRINERIS TENUIS	16				32	64				
9 GLYCERA AMERICANA		48			16	32				
10 PINNIXA CRISTATA		16				64				
11 BUNODACTIS TEXENSIS		16			32				32	
12 STYLOCHUS ELLIPTICUS						64				16
13 AGLAOPHAMUS VERRILLI	16				32				16	16
14 NEMERTEA (YELLOW BANDED)						16			48	
15 PHORONIS ARCHITECTA					64					
16 AMPHARETE (EYES)	16					32			16	
17 GLYCINDE SOLITARIA		16				32				
18 DIOPATRA CUPREA					16				16	16
19 GYPTIS VITTATA					32				16	
20 NEMERTEA (WHITE)		32								
21 NOTOMASTUS LATERICEUS										32
22 AMPITHOE SP	16				16					
23 POLYDORA SOCIALIS	16				16					
24 AMPHIPODA, UN ID						32				
25 CEREBRATULUS LACTEUS	16									
26 MALACOCEROS SP		16								
27 PRIONOSPIO CIRRIFERA		16								
28 AMPELISCA ABDITA						16				
29 NASSARIUS ACUTUS					16					
30 SIGAMBRA TENTACULATA					16					
31 SIGAMBRA WASSI					16					
32 SPIOCHAETOPTERUS OCULATUS					16					
33 PARANTHUS RAPIFORMIS						16				
34 MICROPHOLIS ATRA					16					
35 XANTHIDAE						16				
36 ARICIDEA SP						16				
37 MAGELONA ROSEA									16	
38 STHENELAIS BOA									16	
39 NEOPANOPE TEXANA									16	
40 LISTRIELLA SP		16								
41 ARMANDIA AGILIS	16									
42 BATEA CARTHARINENSIS	16									
TOTAL NUMBER OF INDIVIDUALS	1008	288			1184	848			848	448

TABLE E104
EXPERIMENTAL STUDY BENTHIC DATA: POST-DISPOSAL PHASE SAMPLES.
NUMBER OF INDIVIDUALS/SQ.M. OF EACH SPECIES COLLECTED AT STATION 2-3 ON 31 MAR 76

SURF TEMP	SURF SAL	BOT TEMP	BOT SAL	DEPTH	SED TEMP	TIME ON	TIME OFF
20.0	24.0	19.5	31.0	10.0	19.5	1510	1535

SEDIMENTS: 2 CM OXIDIZED SILT OVER SANDY MUD AND GRAY CLAY.

SPECIES	REPLICATES									
	1		2		3		4		5	
	ADLT	YNG	ADLT	YNG	ADLT	YNG	ADLT	YNG	ADLT	YNG
1 REPLICATES NOT ANALYZED			****	****			****	****		
2 PRIONOSPIO PINNATA	208				320	96			176	32
3 MAGELONA SP	192				64				48	
4 LUMBRINERIS TENUIS	16					160				16
5 NEREIS SP	32				96				64	
6 CEREBRATULUS LACTEUS	64	64							32	
7 GLYCERA AMERICANA	16	16			48				16	32
8 DIOPATRA CUPREA	48	16			16				32	
9 PSEUDEURYTHOE AMBIGUA	32	64			16					
10 GLYCINDE SOLITARIA		48			48					
11 NEMERTEA (YELLOW BANDED)	48								32	
12 BALANOGLOSSUS		16				16				16
13 MEDIOMASTUS CALIFORNIENSIS	32					16				
14 PINNIXA CRISTATA		32								
15 NEMERTEA (YELLOW & PURPLE)					16				16	
16 CALLIANASSA LATISPINA					16					
17 ABRA AEQUALIS	16									
18 AGLAOPHAMUS VERRILLI	16									
19 ANCISTROSYLLIS JONESI	16									
20 MAGELONA ROSEA	16									
21 POLINICES DUPLICATUS	16									
22 MICROPHOLIS ATRA	16									
23 PAGURUS ANNULIPES	16									
24 NINOE NIGRIPES					16					
25 PHORONIS ARCHITECTA					16					
26 SIGAMBRA WASSI					16					
27 PARANTHUS RAPIFORMIS					16					
28 NEMERTEA (WHITE)					16					
29 NUCULANA CONCENTRICA									16	
TOTAL NUMBER OF INDIVIDUALS	800	256			720	288			432	96

TABLE E105
EXPERIMENTAL STUDY BENTHIC DATA: POST-DISPOSAL PHASE SAMPLES.
NUMBER OF INDIVIDUALS/SQ.M. OF EACH SPECIES COLLECTED AT STATION 2-4 ON 31 MAR 76

SURF TEMP	SURF SAL	BOT TEMP	BOT SAL	DEPTH	SED TEMP	TIME ON	TIME OFF
20.0	24.0	19.5	31.0	10.0	20.0	1415	1505

SEDIMENTS: 2 CM OXIDIZED SILT OVER SANDY GRAY CLAY.

SPECIES	REPLICATES									
	1		2		3		4		5	
	ADLT	YNG	ADLT	YNG	ADLT	YNG	ADLT	YNG	ADLT	YNG
1 REPLICATES NOT ANALYZED			****	****			****	****		
2 BALANOGLOSSUS		160				176				
3 PRIONOSPIO PINNATA	128	16			48				48	16
4 MAGELONA SP	176				16				48	
5 SIGAMBRA WASSI	64	32				16			80	16
6 DIOPATRA CUPREA	64				32				96	
7 GLYCINDE SOLITARIA		112				16				48
8 ANCISTROSYLLIS JONESI		32			80				48	
9 COSSURA DELTA	32					32			64	
10 LUMBRINERIS TENUIS		48				16				48
11 GLYCERA AMERICANA	48									16
12 NEMERTEA (YELLOW BANDED)	32				16				16	
13 CEREBRATULUS LACTEUS					32				16	16
14 PINNIXA CRISTATA		32			16					
15 NEREIS SP									48	
16 NOTOMASTUS LATERICEUS	16								16	
17 AMPHIPODA, UN ID					32					
18 CLYMENELLA ZONALIS	16									
19 NUCULANA CONCENTRICA	16									
20 SIGAMBRA TENTACULATA		16								
21 PSEUDEURYTHOE AMBIGUA		16								
22 SPIOCHAETOPTERUS OCULATUS	16									
23 CALLIANASSA LATISPINA	16									
24 AMPELISCA ABDITA					16					
25 NASSARIUS ACUTUS					16					
26 AGLAOPHAMUS VERRILLI									16	
27 MEDIOMASTUS CALIFORNIENSIS									16	
28 NEMERTEA (YELLOW & PURPLE)									16	
TOTAL NUMBER OF INDIVIDUALS	624	464			304	256			528	160

TABLE E106
EXPERIMENTAL STUDY BENTHIC DATA: POST-DISPOSAL PHASE SAMPLES.
NUMBER OF INDIVIDUALS/SQ.M. OF EACH SPECIES COLLECTED AT STATION 2-5 ON 31 MAR 76

SURF TEMP	SURF SAL	BOT TEMP	BOT SAL	DEPTH	SED TEMP	TIME ON	TIME OFF
20.0	24.0	20.0	32.0	10.0	20.0	1420	1440

SEDIMENTS: 2 CM OXIDIZED SILT OVER SANDY GRAY CLAY. MUCH SHELL HASH.

SPECIES	REPLICATES									
	1		2		3		4		5	
	ADLT	YNG	ADLT	YNG	ADLT	YNG	ADLT	YNG	ADLT	YNG
1 REPLICATES NOT ANALYZED			****	****			****	****		
2 LUMBRINERIS TENUIS		48			32	32				48
3 PRICNCSPIO PINNATA	16				48	48				32
4 COROPHIUM ACHERUSICUM	32	48				32				
5 CEREBRATULUS LACTEUS	48					16			16	16
6 COSSURA DELTA	16				16					48
7 GLYCINDE SOLITARIA		16				48				16
8 ANCISTROSYLLIS JONESI	16	16			16					16
9 DIOPATRA CUPREA	16	16			32					
10 PSEUDEURYTHOE AMBIGUA	16	48								
11 AMPELISCA ABDITA									48	16
12 GLYCERA AMERICANA	16	32								
13 NEMERTEA (YELLOW BANDED)					16				32	
14 MAGELONA SP	16								16	
15 NEREIS SP	16				16					
16 PINNIXA CRISTATA		16				16				
17 NEMERTEA (YELLOW & PURPLE)									32	
18 NOTOMASTUS LATERICEUS	16									
19 GYPTIS VITTATA	16									
20 PAGURUS ANNULIPES	16									
21 SIGAMBRA TENTACULATA					16					
22 MULINIA LATERALIS					16					
23 MEDIOMASTUS CALIFORNIENSIS										16
24 SPIOPHANES BOMBYX										16
25 THYONE BRIAREUS									16	
TOTAL NUMBER OF INDIVIDUALS	256	240			208	192			160	224

TABLE E107
EXPERIMENTAL STUDY BENTHIC DATA: POST-DISPOSAL PHASE SAMPLES.
NUMBER OF INDIVIDUALS/SQ.M. OF EACH SPECIES COLLECTED AT STATION 15-1 ON 1 APR 76

SURF TEMP	SURF SAL	BOT TEMP	BOT SAL	DEPTH	SED TEMP	TIME ON	TIME OFF
20.0	24.0	19.5	30.0	10.0	19.5	1415	1435

SEDIMENTS: 1 CM OXIDIZED MUD OVER MUDDY SAND.

SPECIES	REPLICATES									
	1		2		3		4		5	
	ADLT	YNG	ADLT	YNG	ADLT	YNG	ADLT	YNG	ADLT	YNG
1 REPLICATES NOT ANALYZED			****	****			****	****		
2 MAGELONA SP	592				192				112	
3 NEREIS SP	208				48				112	
4 PHORONIS ARCHITECTA	48				304					
5 COROPHIUM ACHERUSICUM					96	48			208	
6 DIOPATRA CUPREA					96	32			16	
7 OGYRIDES LIMICOLA					32	16			64	
8 SIGAMBRA TENTACULATA	16	16			16				32	
9 MEDIOMASTUS CALIFORNIENSIS	32				32					
10 LUMBRINERIS TENUIS		16			32					
11 SPIOCHAETOPTERUS OCULATUS	32				16					
12 NEMERTEA (YELLOW BANDED)					32				16	
13 NEMERTEA (WHITE)	32									
14 NASSARIUS ACUTUS	32									
15 OWENIA FUSIFORMIS	16				16					
16 PRIONOSPIO PINNATA	32									
17 CLYMENELLA ZONALIS					32					
18 BUNODACTIS TEXENSIS					32					
19 HEMIPHOLIS ELONGATA									16	16
20 GYPTIS VITTATA		16								
21 MALDANE SARSI	16									
22 SOLEN VIRIDIS		16								
23 NEREIS SUCCINEA					16					
24 NOTOMASTUS LATERICEUS					16					
25 MYRIOWENIA CALIFORNIENSIS					16					
26 NEPHTYS MAGELLANICA						16				
27 ANAITIDES ERYTHROPHYLLUS					16					
28 STHENELAIS BOA					16					
29 CIRRATULUS HEDGPETHI					16					
30 PARANTHUS RAPIFORMIS					16					
31 PINNIXA LUNZI									16	
32 PRIONOSPIO CIRRIFERA									16	
33 LEPIDONOTUS SUBLEVIS									16	
34 THALASSEMA HARTMANI									16	
35 EDWARDSIA SP										16
TOTAL NUMBER OF INDIVIDUALS	1056	64			1088	112			640	32

TABLE E108
EXPERIMENTAL STUDY BENTHIC DATA: POST-DISPOSAL PHASE SAMPLES.
NUMBER OF INDIVIDUALS/SQ.M. OF EACH SPECIES COLLECTED AT STATION 15-2 ON 1 APR 76

SURF TEMP	SURF SAL	BOT TEMP	BOT SAL	DEPTH	SED TEMP	TIME ON	TIME OFF
20.0	25.0	19.5	33.0	10.0	20.0	1350	1410

SEDIMENTS: 1 CM OXIDIZED MUD OVER LOOSE MUDDY SAND.

SPECIES	REPLICATES									
	1		2		3		4		5	
	ADLT	YNG	ADLT	YNG	ADLT	YNG	ADLT	YNG	ADLT	YNG
1 REPLICATES NOT ANALYZED			****	****			****	****		
2 PRIONOSPIO PINNATA	368				368	112			272	32
3 MEDIOMASTUS CALIFORNIENSIS	96				48				560	
4 MAGELONA SP	96				48				48	
5 PHORONIS ARCHITECTA	16				32				144	
6 PSEUDEURYTHOE AMBIGUA					48				80	16
7 GLYCINDE SOLITARIA	16				32	16				32
8 SIGAMBRA TENTACULATA					32				16	48
9 LUMBRINERIS TENUIS		48								32
10 NEMERTEA (YELLOW BANDED)					48				16	
11 ANCISTROSYLLIS JONESI									32	16
12 CEREBRATULUS LACTEUS	16								16	
13 GLYCERA AMERICANA	16								16	
14 ANACHIS OBESA					32					
15 NEMERTEA (YELLOW & PURPLE)					32					
16 PINNIXA CRISTATA										32
17 NEREIS SUCCINEA										16
18 BALANOGLOSSUS		16								
19 PARANTHUS RAPIFORMIS		16								
20 EDWARDSIA SP		16								
21 NASSARIUS ACUTUS					16					
22 NUCULANA CONCENTRICA					16					
23 SIGAMBRA WASSI					16					
24 SPIOCHAETOPTERUS OCULATUS					16					
25 DIOPATRA CUPREA									16	
26 HEMIPHOLIS ELONGATA									16	
27 NEREIS SP									16	
28 BUNODACTIS TEXENSIS										16
29 MAGELONA ROSEA										16
30 SOLEN VIRIDIS										16
31 TELLINA VERSICOLOR										16
TOTAL NUMBER OF INDIVIDUALS	624	96			784	128			1248	288

TABLE E109
EXPERIMENTAL STUDY BENTHIC DATA: POST-DISPOSAL PHASE SAMPLES.
NUMBER OF INDIVIDUALS/SQ.M. OF EACH SPECIES COLLECTED AT STATION 15-3 ON 1 APR 76

SURF TEMP	SURF SAL	BOT TEMP	BOT SAL	DEPTH	SED TEMP	TIME ON	TIME OFF
20.0	25.0	20.0	33.0	10.0	20.0	1215	1235

SEDIMENTS: 1 CM OXIDIZED MUD OVER LOOSE MUDDY SAND.

SPECIES	REPLICATES									
	1		2		3		4		5	
	ADLT	YNG	ADLT	YNG	ADLT	YNG	ADLT	YNG	ADLT	YNG
1 REPLICATES NOT ANALYZED			****	****			****	****		
2 MEDIOMASTUS CALIFORNIENSIS	720				16				208	
3 PRIONOSPIO PINNATA	208	64			32				256	16
4 PHORONIS ARCHITECTA	336				96				96	
5 MAGELONA SP	176				96				80	
6 BALANOGLOSSUS		16								288
7 NEREIS SP	112				48				64	
8 NEMERTEA (YEL[illegible]NDED)	64				16				96	
9 PARANTHU[illegible]		80								32
10 GLYCINDE S[illegible]		64								
11 LUMBRINERIS TEN[illegible]		32							32	
12 NEMERTEA (YELLOW & [illegible]URPLE)	32				16				16	
13 NATICA PUSILLA	32	16								
14 PSEUDEURYTHOE AMBIGUA	32								16	
15 DIOPATRA CUPREA	32									
16 OWENIA FUSIFORMIS	16				16					
17 SIGAMBRA TENTACULATA		32								
18 OGYRIDES LIMICOLA	16								16	
19 SPIOCHAETOPTERUS OCULATUS					16				16	
20 MELINNA MACULATA									32	
21 ANCISTROSYLLIS JONESI	16									
22 GLYCERA AMERICANA	16									
23 DRILONEREIS LONGA	16									
24 SPIOPHANES BOMBYX	16									
25 BUNODACTIS TEXENSIS		16								
26 MYRIOWENIA CALIFORNIENSIS	16									
27 AGLAOPHAMUS VERRILLI						16				
28 CIRRATULUS HEDGPETHI									16	
TOTAL NUMBER OF INDIVIDUALS	1856	320			352	16			944	336

TABLE E110
EXPERIMENTAL STUDY BENTHIC DATA: POST-DISPOSAL PHASE SAMPLES.
NUMBER OF INDIVIDUALS/SQ.M. OF EACH SPECIES COLLECTED AT STATION 15-4 ON 1 APR 76

SURF TEMP	SURF SAL	BOT TEMP	BOT SAL	DEPTH	SED TEMP	TIME ON	TIME OFF
20.0	25.0	20.0	33.0	10.0	20.0	1310	1340

SEDIMENTS: 2 CM OXIDIZED MUD OVER MUDDY GRAY CLAY. LITTLE SAND.

SPECIES	REPLICATES									
	1		2		3		4		5	
	ADLT	YNG	ADLT	YNG	ADLT	YNG	ADLT	YNG	ADLT	YNG
1 REPLICATES NOT ANALYZED			****	****			****	****		
2 PRIONOSPIO PINNATA	208	48			80					112
3 LUMBRINERIS TENUIS		64				64				16
4 GLYCINDE SOLITARIA		48			16	32				
5 CEREBRATULUS LACTEUS		48			16				16	
6 NINOE NIGRIPES					32					48
7 GLYCERA AMERICANA		16								32
8 LEPIDASTHENIA SP	48									
9 ANCISTROSYLLIS JONESI	16				16					
10 COSSURA DELTA		16			16					
11 DIOPATRA CUPREA	16				16					
12 MEDIOMASTUS CALIFORNIENSIS	32									
13 PINNIXA CRISTATA	32									
14 SIGAMBRA WASSI	16				16					
15 ABRA AEQUALIS	16									
16 ANACHIS OBESA	16									
17 MAGELONA SP	16									
18 NOTOMASTUS LATERICEUS	16									
19 NUCULANA CONCENTRICA	16									
20 SIGAMBRA TENTACULATA					16					
21 NATICA PUSILLA										16
22 NEMERTEA (YELLOW BANDED)									16	
23 NEMERTEA (WHITE)									16	
TOTAL NUMBER OF INDIVIDUALS	448	240			224	96			48	224

TABLE E111
EXPERIMENTAL STUDY BENTHIC DATA: POST-DISPOSAL PHASE SAMPLES.
NUMBER OF INDIVIDUALS/SQ.M. OF EACH SPECIES COLLECTED AT STATION 15-5 ON 1 APR 76

SURF TEMP	SURF SAL	BOT TEMP	BOT SAL	DEPTH	SED TEMP	TIME ON	TIME OFF
20.0	25.0	19.5	32.0	10.0	20.0	1240	1303

SEDIMENTS: 2 CM OXIDIZED MUD OVER SANDY GRAY CLAY.

SPECIES	REPLICATES									
	1		2		3		4		5	
	ADLT	YNG	ADLT	YNG	ADLT	YNG	ADLT	YNG	ADLT	YNG
1 REPLICATES NOT ANALYZED			****	****			****	****		
2 PRIONOSPIO PINNATA	320	32			144	80			448	48
3 GLYCINDE SOLITARIA		128			16	192				
4 PSEUDEURYTHOE AMBIGUA	32	32			16	144			16	16
5 MAGELONA SP	48				64				112	
6 COSSURA DELTA		32				112				64
7 NEREIS SP	48	16			48	16			16	
8 LUMBRINERIS TENUIS		48				32			16	16
9 CEREBRATULUS LACTEUS	16				16				48	
10 CLYMENELLA ZONALIS	16				32	16				
11 DIOPATRA CUPREA	32				16				16	
12 NASSARIUS ACUTUS					64					
13 NEMERTEA (YELLOW BANDED)					48				16	
14 GLYCERA AMERICANA	16				32					
15 NINOE NIGRIPES					16					32
16 PAGURUS ANNULIPES	32									
17 SIGAMBRA TENTACULATA									16	16
18 OWENIA FUSIFORMIS	16									
19 ASYCHIS ELONGATA	16									
20 OGYRIDES LIMICOLA	16									
21 PARANTHUS RAPIFORMIS		16								
22 MEDIOMASTUS CALIFORNIENSIS					16					
23 PINNIXA CRISTATA						16				
24 LEPIDONOTUS SUBLEVIS					16					
25 MICROPHOLIS ATRA					16					
26 BALANOGLOSSUS										16
27 NEMERTEA (YELLOW & PURPLE)									16	
28 ARICIDEA SP									16	
TOTAL NUMBER OF INDIVIDUALS	608	304			560	608			736	208

TABLE E112
EXPERIMENTAL STUDY BENTHIC DATA: POST-DISPOSAL PHASE SAMPLES.
NUMBER OF INDIVIDUALS/SQ.M. OF EACH SPECIES COLLECTED AT STATION 14-1 ON 31 MAR 76

SURF TEMP	SURF SAL	BOT TEMP	BOT SAL	DEPTH	SED TEMP	TIME ON	TIME OFF
19.0	24.0	19.5	30.0	13.0	19.0	805	835

SEDIMENTS: 2 CM OXIDIZED MUD OVER GRAY CLAY. LITTLE SHELL HASH.

SPECIES	REPLICATES									
	1		2		3		4		5	
	ADLT	YNG	ADLT	YNG	ADLT	YNG	ADLT	YNG	ADLT	YNG
1 REPLICATES NOT ANALYZED			****	****			****	****		
2 BALANOGLOSSUS		64								208
3 LUMBRINERIS TENUIS		16			16	32			32	64
4 MAGELONA SP	64	16								
5 ARMANDIA AGILIS	16								64	
6 PINNIXA CRISTATA		16								48
7 GLYCINDE SOLITARIA		16			16					16
8 NINOE NIGRIPES	32				16					
9 NOTOMASTUS LATERICEUS					16					16
10 AMPELISCA ABDITA									16	16
11 ANCISTROSYLLIS JONESI	16									
12 DIOPATRA CUPREA		16								
13 LEPIDASTHENIA SP	16									
14 MEDIOMASTUS CALIFORNIENSIS	16									
15 ANEMONE (SAND ENCRUSTED)	16									
16 ARICIDEA SP	16									
17 AMPHARETE (EYES)		16								
18 PAGURUS ANNULIPES	16									
19 NEPHTYS PICTA		16								
20 SPIOPHANES BOMBYX	16									
21 CEREBRATULUS LACTEUS									16	
22 COSSURA DELTA										16
23 NEREIS SP									16	
24 NUCULANA CONCENTRICA									16	
25 PHORONIS ARCHITECTA									16	
26 MAGELONA ROSEA									16	
27 THYONE BRIAREUS										16
TOTAL NUMBER OF INDIVIDUALS	224	176			64	32			192	400

TABLE E113
EXPERIMENTAL STUDY BENTHIC DATA: POST-DISPOSAL PHASE SAMPLES.
NUMBER OF INDIVIDUALS/SQ.M. OF EACH SPECIES COLLECTED AT STATION 14-2 ON 31 MAR 76

SURF TEMP	SURF SAL	BOT TEMP	BOT SAL	DEPTH	SED TEMP	TIME ON	TIME OFF
19.0	24.0	19.5	30.0	13.0	19.0	850	910

SEDIMENTS: 1-2 CM BROWN OXIDIZED SILT OVER THICK CLAY.

SPECIES	REPLICATES									
	1		2		3		4		5	
	ADLT	YNG	ADLT	YNG	ADLT	YNG	ADLT	YNG	ADLT	YNG
1 REPLICATES NOT ANALYZED			****	****			****	****		
2 PINNIXA CRISTATA		176			16	16				16
3 LUMBRINERIS TENUIS	16	64							16	64
4 NINOE NIGRIPES						96				32
5 ASYCHIS ELONGATA					32				48	
6 DIOPATRA CUPREA	16				32				16	
7 CEREBRATULUS LACTEUS	16								16	
8 NEREIS SP					32					
9 STHENELAIS BOA									32	
10 PHORONIS ARCHITECTA	16									
11 GIANT SPERM	16									
12 PHOTIS SP.		16								
13 GLYCINDE SOLITARIA						16				
14 PRIONOSPIO PINNATA					16					
15 ANAITIDES ERYTHROPHYLLUS					16					
16 CLYMENELLA ZONALIS									16	
17 GLYCERA AMERICANA									16	
18 MAGELONA SP									16	
19 ARMANDIA AGILIS									16	
TOTAL NUMBER OF INDIVIDUALS	80	256			144	128			192	112

TABLE E114
EXPERIMENTAL STUDY BENTHIC DATA: POST-DISPOSAL PHASE SAMPLES.
NUMBER OF INDIVIDUALS/SQ.M. OF EACH SPECIES COLLECTED AT STATION 14-3 ON 31 MAR 76

SURF TEMP	SURF SAL	BOT TEMP	BOT SAL	DEPTH	SED TEMP	TIME ON	TIME OFF
19.0	25.0	19.0	28.0	13.0	19.0	920	945

SEDIMENTS: 30 CM SAND AND SHELL HASH OVER GRAY CLAY. TRACES OF BEAUMONT CLAY.

SPECIES	REPLICATES									
	1		2		3		4		5	
	ADLT	YNG	ADLT	YNG	ADLT	YNG	ADLT	YNG	ADLT	YNG
1 REPLICATES NOT ANALYZED							****	****		
2 LUMBRINERIS TENUIS	32	64	16	32	32	80			16	160
3 PHORONIS ARCHITECTA	32		32		208				80	
4 PAGURUS ANNULIPES	16		80		16					
5 NINOE NIGRIPES			32		16	48			16	
6 AMPHARETE ACUTIFRONS	32		16		32				32	
7 SIGAMBRA WASSI			48						48	
8 AMPELISCA ABDITA			48	16	16	16				
9 PINNIXA CRISTATA		16		16		32				16
10 GLYCINDE SOLITARIA	16			16						32
11 NOTOMASTUS LATERICEUS		48								16
12 DIOPATRA CUPREA				48	16					
13 GLYCERA AMERICANA			16			32				16
14 NEREIS SP			32			16				16
15 AGLAOPHAMUS VERRILLI			16		16	32				
16 MAGELONA SP	16			32						
17 SPIOPHANES BOMBYX					16	32				
18 MEDIOMASTUS CALIFORNIENSIS	16			16						
19 ELECTRA SP (COLONIES)	16				16					
20 CEREBRATULUS LACTEUS				16		16				
21 BALANOGLOSSUS				16	16					
22 PSEUDEURYTHOE AMBIGUA				32						
23 LISTRIELLA SP			32							
24 ANEMONE (SAND ENCRUSTED)					16					16
25 PRIONOSPIO PINNATA					16	16				
26 ARMANDIA AGILIS						32				
27 VITRINELLA HELICOIDEA					32					
28 ANCISTROSYLLIS JONESI	16									
29 CLYMENELLA ZONALIS	16									
30 NATICA PUSILLA	16									
31 NUCULANA CONCENTRICA		16								
32 OWENIA FUSIFORMIS		16								
33 MESOCHAETOPTERUS TAYLORI	16									
34 SIGAMBRA TENTACULATA				16						
35 MAGELONA ROSEA			16							
36 NEMERTEA (WHITE)			16							
37 ASPIDOSIPHON CF SPECIOSUS			16							
38 COROPHIUM LOUISIANUM			16							
39 STYLOCHUS ELLIPTICUS			16							
40 NEPHTYS PICTA										16
41 CLYMENELLA TORQUATA CALIDA						16				
42 ASYCHIS ELONGATA					16					
43 PALEONOTUS HETEROSETA					16					
44 THARYX SETIGERA			16							
TOTAL NUMBER OF INDIVIDUALS	240	160	464	256	496	368			192	288

TABLE E115
EXPERIMENTAL STUDY BENTHIC DATA: POST-DISPOSAL PHASE SAMPLES.
NUMBER OF INDIVIDUALS/SQ.M. OF EACH SPECIES COLLECTED AT STATION 14-4 ON 31 MAR 76

SURF TEMP	SURF SAL	BOT TEMP	BOT SAL	DEPTH	SED TEMP	TIME ON	TIME OFF
19.5	25.0	20.0	32.0	15.0	19.0	955	1010

SEDIMENTS: 2 CM OXIDIZED MUD OVER SOLID GRAY CLAY.

SPECIES	REPLICATES									
	1		2		3		4		5	
	ADLT	YNG	ADLT	YNG	ADLT	YNG	ADLT	YNG	ADLT	YNG
1 REPLICATES NOT ANALYZED			****	****			****	****		
2 LUMBRINERIS TENUIS	32				16	48			48	96
3 DIOPATRA CUPREA	128					32			48	
4 PHOTIS SP.	144								48	
5 AMPELISCA ABDITA	32	32			16				48	
6 MAGELONA SP					112				16	
7 HEMIPHOLIS ELONGATA	16				80	16				
8 NINOE NIGRIPES	48				32					16
9 MICROPHOLIS ATRA					16	64				
10 SIGAMBRA WASSI	32								32	
11 PINNIXA CRISTATA		64								
12 CLYMENELLA ZONALIS	32					16				
13 AMPITHOE SP	32									
14 CEREBRATULUS LACTEUS		16				16				
15 NEREIS SP	16				16					
16 ARICIDEA SP						32				
17 NOTOMASTUS LATERICEUS									32	
18 NUCULANA CONCENTRICA		16								
19 PRIONOSPIO PINNATA									16	
20 GYPTIS VITTATA	16									
21 ARMANDIA AGILIS	16									
22 GLYCINDE SOLITARIA					16					
23 LEPIDASTHENIA SP					16					
24 PHORONIS ARCHITECTA					16					
25 PECTINARIA GOULDII					16					
26 PALEONOTUS HETEROSETA					16					
27 ASYCHIS ELONGATA					16					
28 SCHISTOMERINGOS RUDOLPHI					16					
29 BALANOGLOSSUS										16
30 PERSEPHONA CRINATA									16	
31 NEMERTEA (WHITE)									16	
32 VITRINELLA HELICOIDEA									16	
TOTAL NUMBER OF INDIVIDUALS	544	128			400	224			336	128

TABLE E116
EXPERIMENTAL STUDY BENTHIC DATA: POST-DISPOSAL PHASE SAMPLES.
NUMBER OF INDIVIDUALS/SQ.M. OF EACH SPECIES COLLECTED AT STATION 14-5 ON 31 MAR 76

SURF TEMP	SURF SAL	BOT TEMP	BOT SAL	DEPTH	SED TEMP	TIME ON	TIME OFF
19.5	25.0	20.0	32.0	15.0	19.0	1025	1055

SEDIMENTS: LAYER OF SANDY CLAY WITH LOTS OF SHELL HASH OVER GRAY CLAY.

SPECIES	REPLICATES									
	1		2		3		4		5	
	ADLT	YNG	ADLT	YNG	ADLT	YNG	ADLT	YNG	ADLT	YNG
1 REPLICATES NOT ANALYZED			****	****			****	****		
2 PHORONIS ARCHITECTA	160				496				240	
3 AMPELISCA ABDITA	96	112			272				144	224
4 PRIONOSPIO PINNATA		16			64	176			32	32
5 LUMBRINERIS TENUIS	32	48			48	48			32	80
6 NEREIS SP	16	16				16			80	144
7 PHOTIS SP.					112				96	
8 DIOPATRA CUPREA	16	64				16				80
9 AGLAOPHAMUS VERRILLI		32				16			16	64
10 PAGURUS ANNULIPES	32				16				80	
11 ANAITIDES ERYTHROPHYLLUS	16	32			32				16	16
12 AMPHARETE ACUTIFRONS	96								16	
13 SIGAMBRA WASSI	16				64				16	
14 GLYCERA AMERICANA		16				16				48
15 TELLINA VERSICOLOR	16	16							48	
16 MAGELONA SP					16				64	
17 CEREBRATULUS LACTEUS									16	64
18 AMPITHOE SP	16	16							32	
19 SIGAMBRA TENTACULATA					32				16	
20 SPIOPHANES BOMBYX						32				16
21 GLYCINDE SOLITARIA	16	16				16				
22 AMPHARETE (EYES)	48									
23 EUCERAMUS PRAELONGUS		32							16	
24 ANCISTROSYLLIS JONESI	16	16								
25 NEPHTYS PICTA		32								
26 BATEA CARTHARINENSIS		32								
27 NEMERTEA (YELLOW BANDED)					16				16	
28 LEPIDONOTUS SUBLEVIS						16			16	
29 NOTOMASTUS LATERICEUS									32	
30 COROPHIUM ACHERUSICUM		16			16					
31 PINNIXA CRISTATA	16									16
32 CLYMENELLA ZONALIS									16	
33 LEPTOCHEIRUS SP.					16					
34 ANADARA TRANSVERSA		16								
35 NEREIS SUCCINEA	16									
36 NINOE NIGRIPES	16									
37 CLYMENELLA TORQUATA CALIDA	16									
38 MONOCULODES SP	16									
39 MEDIOMASTUS CALIFORNIENSIS					16					
40 CIRRATULUS HEDGPETHI						16				
41 NEPHTYS INCISA						16				
42 GYPTIS VITTATA						16				
43 NEOPANOPE TEXANA						16				
44 MAGELONA ROSEA									16	
45 THARYX SETIGERA									16	
46 ASYCHIS ELONGATA									16	
47 HEPATUS EPHELITICUS										16
48 NEMERTEA (WHITE)									16	
49 MICROPHOLIS ATRA									16	
50 VITRINELLA HELICOIDEA									16	
51 PISTA CRISTATA									16	
TOTAL NUMBER OF INDIVIDUALS	672	528			1216	416			1152	800

TABLE E117
EXPERIMENTAL STUDY BENTHIC DATA: POST-DISPOSAL PHASE SAMPLES.
NUMBER OF INDIVIDUALS/SQ.M. OF EACH SPECIES COLLECTED AT STATION 12-1 ON 31 MAR 76

SURF TEMP	SURF SAL	BOT TEMP	BOT SAL	DEPTH	SED TEMP	TIME ON	TIME OFF
20.0	25.0	20.0	32.0	13.0	20.0	1340	1405

SEDIMENTS: 2 CM OXIDIZED SILT OVER GRAY CLAY.

SPECIES	REPLICATES									
	1		2		3		4		5	
	ADLT	YNG	ADLT	YNG	ADLT	YNG	ADLT	YNG	ADLT	YNG
1 REPLICATES NOT ANALYZED			****	****			****	****		
2 BALANOGLOSSUS						32				224
3 NEREIS SP					32				96	
4 PINNIXA CRISTATA		48				16				32
5 CEREBRATULUS LACTEUS	32				32					32
6 MAGELONA SP	16								80	
7 DIOPATRA CUPREA					32				64	
8 NUCULANA CONCENTRICA	32	16			32					
9 NINOE NIGRIPES	48								16	
10 ARMANDIA AGILIS	32								32	
11 ANCISTROSYLLIS JONESI		32							16	
12 GLYCERA AMERICANA		16				16				16
13 LUMBRINERIS TENUIS					16	16				16
14 POLYDORA SOCIALIS									48	
15 GLYCINDE SOLITARIA		32								
16 ASYCHIS ELONGATA	16	16								
17 STHENELAIS BOA						32				
18 SIGAMBRA TENTACULATA									32	
19 SIGAMBRA WASSI									32	
20 ABRA AEQUALIS	16									
21 NOTOMASTUS LATERICEUS	16									
22 ANAITIDES ERYTHROPHYLLUS		16								
23 STYLOCHUS ELLIPTICUS	16									
24 VOLVULELLA TEXASIANA	16									
25 HEMIPHOLIS ELONGATA					16					
26 AMPELISCA ABDITA									16	
27 NASSARIUS ACUTUS									16	
28 NEMERTEA (YELLOW BANDED)									16	
29 PRIONOSPIO PINNATA									16	
30 AMPHARETE (EYES)										16
31 BUNODACTIS TEXENSIS										16
32 TELLINA VERSICOLOR										16
TOTAL NUMBER OF INDIVIDUALS	240	176			160	112			480	368

TABLE E118
EXPERIMENTAL STUDY BENTHIC DATA: POST-DISPOSAL PHASE SAMPLES.
NUMBER OF INDIVIDUALS//SQ.M. OF EACH SPECIES COLLECTED AT STATION 12-2 ON 31 MAR 76

SURF TEMP	SURF SAL	BOT TEMP	BOT SAL	DEPTH	SED TEMP	TIME ON	TIME OFF
20.0	25.0	20.0	32.0	13.0	20.0	1310	1335

SEDIMENTS: SANDY MUD OVER GRAY CLAY. SOME SHELL HASH.

SPECIES	REPLICATES 1		2		3		4		5	
	ADLT	YNG	ADLT	YNG	ADLT	YNG	ADLT	YNG	ADLT	YNG
1 REPLICATES NOT ANALYZED			****	****			****	****		
2 BALANOGLOSSUS		192								144
3 LUMBRINERIS TENUIS	16	48			32	32			16	128
4 MAGELONA SP	64								144	
5 NINOE NIGRIPES	16	48			16	16			80	
6 CEREBRATULUS LACTEUS	16	32			32	48			16	
7 DIOPATRA CUPREA	16				64	16			16	
8 GLYCINDE SOLITARIA		64								16
9 PHORONIS ARCHITECTA	16				16				48	
10 PINNIXA CRISTATA		16				64				
11 NEREIS SP									80	
12 PRIONOSPIO PINNATA	16					16			16	16
13 ASYCHIS ELONGATA	32				16					
14 MEDIOMASTUS CALIFORNIENSIS									48	
15 NUCULANA CONCENTRICA									16	32
16 GLYCERA AMERICANA	16					16				
17 HEMIPHOLIS ELONGATA	16	16								
18 SIGAMBRA WASSI	16				16					
19 LEPIDONOTUS SUBLEVIS		16							16	
20 MICROPHOLIS ATRA	16									16
21 COSSURA DELTA					16					16
22 NEREIS SUCCINEA					32					
23 SIGAMBRA TENTACULATA	16									
24 NEPHTYS PICTA	16									
25 AMPHARETE ACUTIFRONS	16									
26 LISTRIELLA SP	16									
27 ELECTRA SP (COLONIES)	16									
28 AMPELISCA ABDITA					16					
29 AGLAOPHAMUS VERRILLI						16				
30 NEMERTEA (YELLOW & PURPLE)					16					
31 AMPHARETE (EYES)					16					
32 BATEA CARTHARINENSIS					16					
33 BUNODACTIS TEXENSIS						16				
34 CLYMENELLA ZONALIS									16	
35 LEPIDASTHENIA SP									16	
36 POECILOCHAETUS JOHNSONI									16	
37 AUTOMATE EVERMANNI									16	
38 GIANT SPERM									16	
39 NEMERTEA (WHITE)									16	
TOTAL NUMBER OF INDIVIDUALS	336	432			304	240			592	368

TABLE E119
EXPERIMENTAL STUDY BENTHIC DATA: POST-DISPOSAL PHASE SAMPLES.
NUMBER OF INDIVIDUALS/SQ.M. OF EACH SPECIES COLLECTED AT STATION 12-3 ON 31 MAR 76

SURF TEMP	SURF SAL	BOT TEMP	BOT SAL	DEPTH	SED TEMP	TIME ON	TIME OFF
20.0	25.0	19.5	32.0	13.0	20.0	1245	1305

SEDIMENTS: HARD SAND AND SHELL HASH WITH SOME GRAY CLAY.

SPECIES	REPLICATES									
	1		2		3		4		5	
	ADLT	YNG	ADLT	YNG	ADLT	YNG	ADLT	YNG	ADLT	YNG
1 REPLICATES NOT ANALYZED			****	****			****	****		
2 SPIOPHANES BOMBYX	384	2304			720	1056			464	1264
3 NEMATODA	192				1488	224			128	48
4 ANAITIDES ERYTHROPHYLLUS	112	16				80			128	128
5 MEDIOMASTUS CALIFORNIENSIS	224				128					
6 PHORONIS ARCHITECTA	48				80				176	
7 NEREIS SP	48	32			144				48	
8 PRIONOSPIO PINNATA	64	32				32			48	48
9 AGLAOPHAMUS VERRILLI	32	96							48	16
10 COROPHIUM ACHERUSICUM					96	80				
11 NEMERTEA (YELLOW BANDED)	64	80							32	
12 AMPELISCA ABDITA	16				32	32			32	32
13 LUMBRINERIS TENUIS	16	32				16				80
14 GLYCERA AMERICANA	16	16				64			32	
15 MAGELONA SP	80				32					
16 NEMERTEA (WHITE)		48			48				16	
17 PAGURUS ANNULIPES		16			16				48	32
18 ABRA AEQUALIS		64				16				
19 TELLINA VERSICOLOR		48				32				
20 NEPHTYS PICTA									16	64
21 NOTOMASTUS LATERICEUS		16				16			16	16
22 EUCERAMUS PRAELONGUS						64				
23 AMPHIPODA, UN ID					64					
24 NEPHTYS MAGELLANICA						64				
25 AMPHARETE (EYES)		32								16
26 OGYRIDES LIMICOLA	32								16	
27 AMPHARETE ACUTIFRONS					16				16	16
28 SIGAMBRA TENTACULATA	16					16				
29 NOTOMASTUS HEMIPODUS	16									
30 CLYTIA CORONATA (COLONIES)	16									
31 STYLOCHUS ELLIPTICUS						16				
32 PERSEPHONA CRINATA					16					
33 MAGELONA ROSEA					16					
34 CREPIDULA FORNICATA						16				
35 PINNIXA CRISTATA										16
36 PRIONOSPIO HETEROBRANCHIA					16					
37 THARYX SETIGERA					16					
38 EDWARDSIA SP						16				
39 ARICIDEA SP									16	
40 SIGAMBRA WASSI					16					
41 BRANCHIOSTOMA CARIBAEUM									16	
TOTAL NUMBER OF INDIVIDUALS	1376	2832			2944	1840			1296	1776

TABLE E120
EXPERIMENTAL STUDY BENTHIC DATA: POST-DISPOSAL PHASE SAMPLES.
NUMBER OF INDIVIDUALS/SQ.M. OF EACH SPECIES COLLECTED AT STATION 12-4 ON 31 MAR 76

SURF TEMP	SURF SAL	BOT TEMP	BOT SAL	DEPTH	SED TEMP	TIME ON	TIME OFF
20.0	25.0	20.0	32.0	13.0	20.0	1210	1240

SEDIMENTS: 2 CM OXIDIZED MUDDY GRAY CLAY. SOME LARGE SHELL.

SPECIES	REPLICATES									
	1		2		3		4		5	
	ADLT	YNG	ADLT	YNG	ADLT	YNG	ADLT	YNG	ADLT	YNG
1 REPLICATES NOT ANALYZED			****	****			****	****		
2 MAGELONA SP	160								64	
3 BALANOGLOSSUS	80								32	
4 AMPELISCA ABDITA		16							48	32
5 ARMANDIA AGILIS	32	16			32					
6 ANCISTROSYLLIS JONESI		64								
7 CEREBRATULUS LACTEUS		16							48	
8 CLYMENELLA ZONALIS	16								48	
9 GLYCINDE SOLITARIA	16	16							32	
10 SIGAMBRA WASSI	16								48	
11 NINOE NIGRIPES									64	
12 DIOPATRA CUPREA	16				32					
13 NEREIS SP		48								
14 NOTOMASTUS LATERICEUS	16	16								16
15 PRIONOSPIO PINNATA		16								32
16 LUMBRINERIS TENUIS						32				16
17 MEDIOMASTUS CALIFORNIENSIS	16				16					
18 PINNIXA CRISTATA		32								
19 VITRINELLA HELICOIDEA	16								16	
20 ABRA AEQUALIS					16				16	
21 COSSURA DELTA		16								
22 NASSARIUS ACUTUS	16									
23 ASYCHIS ELONGATA	16									
24 BATEA CARTHARINENSIS	16									
25 GLYCERA AMERICANA					16					
26 STHENELAIS BOA					16					
27 OGYRIDES LIMICOLA									16	
28 XANTHIDAE										16
29 NEPHTYS INCISA									16	
30 VOLVULELLA TEXASIANA									16	
31 EUCERAMUS PRAELONGUS									16	
32 THARYX SETIGERA									16	
TOTAL NUMBER OF INDIVIDUALS	432	256			128	32			496	112

TABLE E121
EXPERIMENTAL STUDY BENTHIC DATA: POST-DISPOSAL PHASE SAMPLES.
NUMBER OF INDIVIDUALS/SQ.M. OF EACH SPECIES COLLECTED AT STATION 12-5 ON 31 MAR 76

SURF TEMP	SURF SAL	BOT TEMP	BOT SAL	DEPTH	SED TEMP	TIME ON	TIME OFF
20.0	25.0	20.0	32.C	13.0	20.0	1110	1145

SEDIMENTS: 2 CM OXIDIZED SANDY MUD OVER SANDY CLAY. LITTLE SHELL HASH.

SPECIES	REPLICATES									
	1		2		3		4		5	
	ADLT	YNG	ADLT	YNG	ADLT	YNG	ADLT	YNG	ADLT	YNG
1 REPLICATES NOT ANALYZED			****	****			****	****		
2 BALANCGLOSSUS		480				2048				400
3 LUMBRINERIS TENUIS		64			32	112				160
4 NEREIS SP	48				48				112	48
5 PINNIXA CRISTATA		48				16				176
6 MAGELONA SP	32				128				64	
7 CEREBRATULUS LACTEUS		32			16	32			80	
8 ASYCHIS ELONGATA									80	48
9 ARMANDIA AGILIS	16				48	16			32	
10 AMPELISCA ABDITA					32	16			32	
11 CLYMENELLA ZONALIS	16				48					
12 GLYCERA AMERICANA					16				16	16
13 PRICNOSPIO PINNATA		16				16				
14 SIGAMBRA WASSI		16			16					
15 NATICA PUSILLA					32					
16 NEMERTEA (YELLOW BANDED)					32					
17 SIGAMBRA TENTACULATA					32					
18 GLYCINDE SOLITARIA										32
19 PHOTIS SP.					16					
20 MEDIOMASTUS CALIFORNIENSIS	16									
21 POLYCCONTES LUPINA	16									
22 SINUM MACULATUM		16								
23 HEMIPHOLIS ELONGATA						16				
24 NUCULANA CONCENTRICA					16					
25 MAGELONA ROSEA					16					
26 STYLOCHUS ELLIPTICUS					16					
27 NEMERTEA (WHITE)						16				
28 AMPITHOE SP					16					
29 AGLAOPHAMUS VERRILLI									16	
30 ANCISTROSYLLIS JONESI										16
31 LEPIDASTHENIA SP									16	
TOTAL NUMBER OF INDIVIDUALS	144	672			560	2288			448	896

TABLE E122
EXPERIMENTAL STUDY BENTHIC DATA: POST-DISPOSAL PHASE SAMPLES.
NUMBER OF INDIVIDUALS/SQ.M. OF EACH SPECIES COLLECTED AT STATION 27-1 ON 1 APR 76

SURF TEMP	SURF SAL	BOT TEMP	BOT SAL	DEPTH	SED TEMP	TIME ON	TIME OFF
20.0	25.0	19.5	32.0	12.0	20.0	1100	1130

SEDIMENTS: 2 CM OXIDIZED MUD OVER MUDDY GRAY CLAY.

SPECIES	REPLICATES									
	1		2		3		4		5	
	ADLT	YNG	ADLT	YNG	ADLT	YNG	ADLT	YNG	ADLT	YNG
1 REPLICATES NOT ANALYZED			****	****			****	****		
2 DIOPATRA CUPREA	96				32				160	16
3 NEREIS SP					16				144	16
4 CEREBRATULUS LACTEUS	32				16				64	32
5 LUMBRINERIS TENUIS		32				80				32
6 MAGELONA SP	16				80				48	
7 HEMIPHOLIS ELONGATA									80	16
8 PINNIXA CRISTATA						48				16
9 SIGAMBRA WASSI	32								32	
10 BALANOGLOSSUS						48				16
11 SIGAMBRA TENTACULATA					16				16	
12 MEDIOMASTUS CALIFORNIENSIS					16					
13 NEMERTEA (YELLOW BANDED)					16					
14 NINOE NIGRIPES						16				
15 NOTOMASTUS LATERICEUS					16					
16 CALLIANASSA LATISPINA					16					
17 NEREIS SUCCINEA									16	
18 ASYCHIS ELONGATA									16	
19 COROPHIUM ACHERUSICUM									16	
TOTAL NUMBER OF INDIVIDUALS	176	32			224	192			592	144

TABLE E123
EXPERIMENTAL STUDY BENTHIC DATA: POST-DISPOSAL PHASE SAMPLES.
NUMBER OF INDIVIDUALS/SQ.M. OF EACH SPECIES COLLECTED AT STATION 27-2 ON 1 APR 76

SURF TEMP	SURF SAL	BOT TEMP	BOT SAL	DEPTH	SED TEMP	TIME ON	TIME OFF
20.0	25.0	20.0	32.0	12.0	20.0	1025	1055

SEDIMENTS: 2 CM OXIDIZED MUD OVER GRAY CLAY. SOME BIG SHELL.

SPECIES	REPLICATES									
	1		2		3		4		5	
	ADLT	YNG	ADLT	YNG	ADLT	YNG	ADLT	YNG	ADLT	YNG
1 REPLICATES NOT ANALYZED			****	****			****	****		
2 BALANOGLOSSUS					144					
3 LUMBRINERIS TENUIS		64				64				
4 MAGELONA SP	32				48				16	16
5 DIOPATRA CUPREA					32				80	
6 GLYCINDE SOLITARIA		48				32				
7 NEREIS SP		48			16				16	
8 SIGAMBRA WASSI	16				32				16	
9 LEPIDASTHENIA SP					32				16	
10 CEREBRATULUS LACTEUS	16	16							16	
11 PINNIXA CRISTATA						32				
12 CLYMENELLA ZONALIS	16	16								
13 HEMIPHOLIS ELONGATA									32	
14 ASYCHIS ELONGATA									16	16
15 PARANTHUS RAPIFORMIS		16								
16 NEPHTYS INCISA	16									
17 COSSURA DELTA					16					
18 NINOE NIGRIPES						16				
19 SIGAMBRA TENTACULATA					16					
20 SPIOCHAETOPTERUS OCULATUS					16					
21 POLYDORA SOCIALIS					16					
22 GYPTIS VITTATA						16				
23 EUCERAMUS PRAELONGUS						16				
24 PAGURUS ANNULIPES									16	
25 POLYODONTES LUPINA									16	
TOTAL NUMBER OF INDIVIDUALS	96	208			368	176			240	32

TABLE E124
EXPERIMENTAL STUDY BENTHIC DATA: POST-DISPOSAL PHASE SAMPLES.
NUMBER OF INDIVIDUALS/SQ.M. OF EACH SPECIES COLLECTED AT STATION 27-3 ON 1 APR 76

SURF TEMP	SURF SAL	BOT TEMP	BOT SAL	DEPTH	SED TEMP	TIME ON	TIME OFF
21.0	25.0	19.5	32.0	13.0	20.0	845	920

SEDIMENTS: 2 CM OXIDIZED MUD OVER GRAY CLAY.

SPECIES	REPLICATES									
	1		2		3		4		5	
	ADLT	YNG	ADLT	YNG	ADLT	YNG	ADLT	YNG	ADLT	YNG
1 REPLICATES NOT ANALYZED			****	****			****	****		
2 DIOPATRA CUPREA	16				64				96	
3 LUMBRINERIS TENUIS		32				48				96
4 MAGELONA SP									80	32
5 PINNIXA CRISTATA		16								64
6 CEREBRATULUS LACTEUS					32				32	16
7 CLYMENELLA ZONALIS	16								16	16
8 NEREIS SP	16									32
9 SIGAMBRA WASSI					16				32	
10 BALANOGLOSSUS										48
11 MEDIOMASTUS CALIFORNIENSIS									32	
12 GLYCERA AMERICANA	16									
13 NUCULANA CONCENTRICA	16									
14 PRIONOSPIO PINNATA	16									
15 MAGELONA ROSEA	16									
16 POLYDORA SOCIALIS	16									
17 GLYCINDE SOLITARIA						16				
18 AMPELISCA ABDITA									16	
19 ANCISTROSYLLIS JONESI									16	
20 NINOE NIGRIPES										16
21 ASYCHIS ELONGATA									16	
22 STHENELAIS BOA										16
23 PSEUDOPOLYDORA SP									16	
TOTAL NUMBER OF INDIVIDUALS	128	48			112	64			352	336

TABLE E125
EXPERIMENTAL STUDY BENTHIC DATA: POST-DISPOSAL PHASE SAMPLES.
NUMBER OF INDIVIDUALS/SQ.M. OF EACH SPECIES COLLECTED AT STATION 27-4 ON 1 APR 76

SURF TEMP	SURF SAL	BOT TEMP	BOT SAL	DEPTH	SED TEMP	TIME ON	TIME OFF
20.0	25.0	20.0	32.0	13.0	20.0	1055	1017

SEDIMENTS: 2 CM OXIDIZED SILT OVER FIRM GRAY CLAY.

SPECIES	REPLICATES									
	1		2		3		4		5	
	ADLT	YNG	ADLT	YNG	ADLT	YNG	ADLT	YNG	ADLT	YNG
1 REPLICATES NOT ANALYZED			****	****			****	****		
2 LUMBRINERIS TENUIS	80	64				64				112
3 BALANOGLOSSUS		16				176				64
4 MAGELONA SP	64				96				96	
5 AMPELISCA ABDITA		16			64	96				
6 SIGAMBRA TENTACULATA	16					16			80	32
7 DIOPATRA CUPREA	48				16	16			48	
8 GLYCERA AMERICANA	64	16			16				32	
9 NINOE NIGRIPES	48					16			48	16
10 PHOTIS SP.						96				
11 CEREBRATULUS LACTEUS	32	16							48	
12 ARMANDIA AGILIS					80	16				
13 SIGAMBRA WASSI	48				16					
14 AMPHIPODA, UN ID	64									
15 NEREIS SP	16				16				16	
16 PRIONOSPIO PINNATA					16				16	16
17 STHENELAIS BOA									32	16
18 PINNIXA CRISTATA		16				16				
19 ASYCHIS ELONGATA						16				16
20 SPIOCHAETOPTERUS OCULATUS					16				16	
21 HEMIPHOLIS ELONGATA	16									
22 NEREIS SUCCINEA	16									
23 OWENIA FUSIFORMIS	16									
24 AMPHARETE ACUTIFRONS		16								
25 BATEA CARTHARINENSIS	16									
26 MICROPHOLIS ATRA	16									
27 LEPIDASTHENIA SP					16					
28 GIANT SPERM					16					
29 VOLVULELLA TEXASIANA					16					
30 GLYCINDE SOLITARIA										16
31 PHASCOLION STROMBI									16	
32 MAGELONA ROSEA									16	
33 POLYDORA SOCIALIS									16	
TOTAL NUMBER OF INDIVIDUALS	560	160			384	528			480	288

TABLE E126
EXPERIMENTAL STUDY BENTHIC DATA: POST-DISPOSAL PHASE SAMPLES.
NUMBER OF INDIVIDUALS/SQ.M. OF EACH SPECIES COLLECTED AT STATION 27-5 ON 1 APR 76

SURF TEMP	SURF SAL	BOT TEMP	BOT SAL	DEPTH	SED TEMP	TIME ON	TIME OFF
20.0	25.0	19.5	32.0	13.0	19.5	925	950

SEDIMENTS: 2 CM OXIDIZED MUD OVER MUDDY GRAY CLAY. MUCH LARGE SHELL.

SPECIES	REPLICATES									
	1		2		3		4		5	
	ADLT	YNG	ADLT	YNG	ADLT	YNG	ADLT	YNG	ADLT	YNG
1 REPLICATES NOT ANALYZED			****	****			****	****		
2 MAGELONA SP	96				32				48	
3 CEREBRATULUS LACTEUS	16	16			16				32	48
4 DIOPATRA CUPREA	32				32				16	16
5 LUMBRINERIS TENUIS		16				32				48
6 NUCULANA CONCENTRICA									48	16
7 HEMIPHOLIS ELONGATA	16				16				16	
8 PINNIXA CRISTATA		32								16
9 SIGAMBRA TENTACULATA	32								16	
10 AMPELISCA ABDITA					16					32
11 NEREIS SP		16			16					
12 COROPHIUM ACHERUSICUM		32								
13 NATICA PUSILLA	16									
14 NEREIS SUCCINEA	16									
15 PRIONOSPIO PINNATA		16								
16 MAGELONA ROSEA	16									
17 CLYMENELLA ZONALIS					16					
18 COSSURA DELTA					16					
19 ASYCHIS ELONGATA					16					
20 NEPHTYS PICTA					16					
21 POECILOCHAETUS JOHNSONI					16					
22 NEMERTEA (WHITE)					16					
23 ANCISTROSYLLIS JONESI									16	
24 GLYCERA AMERICANA										16
25 GLYCINDE SOLITARIA										16
26 ARMANDIA AGILIS									16	
27 LISTRIELLA SP									16	
TOTAL NUMBER OF INDIVIDUALS	240	128			224	32			224	208

TABLE E127
EXPERIMENTAL STUDY BENTHIC DATA: POST-DISPOSAL PHASE SAMPLES.
NUMBER OF INDIVIDUALS/SQ.M. OF EACH SPECIES COLLECTED AT STATION 2-1 ON 24 MAY 76

SURF TEMP	SURF SAL	BOTT TEMP	BOT SAL	DEPTH	SED TEMP	TIME ON	TIME OFF
26.5	23.0	24.5	30.0	10.0	24.5	1550	1630

SEDIMENTS: 2 CM OXIDIZED SILT OVER SAND. SOME BEAUMONT CLAY.

SPECIES	REPLICATES 1 ADLT	1 YNG	2 ADLT	2 YNG	3 ADLT	3 YNG	4 ADLT	4 YNG	5 ADLT	5 YNG
1 SPIOPHANES BOMBYX	160	64	16				624	432	128	80
2 PRIONOSPIO DAYI	144	128					288	64	176	
3 MEDIOMASTUS CALIFORNIENSIS	80		96		112		80		144	
4 PRIONOSPIO PINNATA			224	80	128	48				
5 NEMERTEA (YELLOW BANDED)	16	32		112		32	16	48		16
6 OXYURCSTYLIS SALIMOI	128	32		16		16	48			
7 MAGELONA SP			48		64		64		64	
8 SCOLEPSIS SQUAMATA	16	80					16	64	16	
9 MAGELONA RIOJAI	144								32	
10 NEPHTYS PICTA	64						32		48	32
11 NEREIS SP			16		16		32		96	
12 GLYCINDE SOLITARIA		16		64		64				16
13 ABRA AEQUALIS	16	32		32		32				
14 PSEUDOPOLYDORA SP	80						32			
15 ANAITIDES ERYTHROPHYLLUS	16						48	16	16	
16 GLYCERA AMERICANA			16	16					48	
17 NASSARIUS ACUTUS				64				16		
18 NEREIS SUCCINEA	16						32	16		
19 PAGURUS ANNULIPES		16	16				16	16		
20 TELLINA VERSICOLOR		48	16							
21 CEREBRATULUS LACTEUS				16	16				16	
22 THARYX SETIGERA		16					16			16
23 BATEA CARTHARINENSIS							32			
24 AGLAOPHAMUS VERRILLI	16	16								
25 AMPELISCA ABDITA	16								16	
26 HEMIPHOLIS ELONGATA		16								16
27 COROPHIUM ACHERUSICUM		16						16		
28 CREPIDULA PLANA	32									
29 NATICA PUSILLA				16				16		
30 NEMERTEA (YELLOW & PURPLE)				16						16
31 ELASMOPUS RAPAX								32		
32 POLYDORA SOCIALIS							16	16		
33 SOLEN VIRIDIS								32		
34 LUMBRINERIS TENUIS									16	16
35 ARGISSA AGMATIPES	16									
36 MONOCULODES SP		16								
37 OGYRIDES LIMICOLA	16									
38 NEMERTEA (WHITE)	16									
39 CLYTIA CORONATA (COLONIES)	16									
40 PAGURUS POLLICARIS		16								
41 SIGAMBRA TENTACULATA				16						
42 STYLOCHUS ELLIPTICUS			16							
43 MULINIA LATERALIS				16						
44 MERCENARIA MERCENARIA				16						
45 GYPTIS VITTATA					16					
46 ANADARA TRANSVERSA								16		
47 DIOPATRA CUPREA							16			
48 LISTRIELLA SP							16			
49 SCOLOPLOS (LEODAMUS) RUBRA							16			
50 PARANTHUS RAPIFORMIS								16		
51 PINNIXA CRISTATA										16
52 MAGELONA ROSEA									16	
TOTAL NUMBER OF INDIVIDUALS	1008	544	464	480	352	192	1440	816	832	224

TABLE E128
EXPERIMENTAL STUDY BENTHIC DATA: POST-DISPOSAL PHASE SAMPLES.
NUMBER OF INDIVIDUALS/SQ.M. OF EACH SPECIES COLLECTED AT STATION 2-2 ON 24 MAY 76

SURF TEMP	SURF SAL	BOT TEMP	BOT SAL	DEPTH	SED TEMP	TIME ON	TIME OFF
26.0	23.0	24.0	31.0	10.0	24.5	1515	1540

SEDIMENTS: 2 CM OXIDIZED MUD OVER 10 CM MUDDY SAND OVER HARD SAND

SPECIES	REPLICATES									
	1		2		3		4		5	
	ADLT	YNG	ADLT	YNG	ADLT	YNG	ADLT	YNG	ADLT	YNG
1 REPLICATES NOT ANALYZED			****	****			****	****		
2 PRIONOSPIO PINNATA	96	32			368	80			288	64
3 GLYCINDE SOLITARIA		112			16	224				80
4 MAGELONA SP	128								208	
5 OXYUROSTYLIS SALINOI	112				48				64	
6 BALANOGLOSSUS						80				112
7 LUMBRINERIS TENUIS	16	48				16			16	16
8 NEMERTEA (YELLOW BANDED)	64								32	16
9 COSSURA DELTA	16				16				48	
10 NEREIS SP	32								32	
11 SIGAMBRA TENTACULATA	32									32
12 AMPELISCA ABDITA						48				16
13 CEREBRATULUS LACTEUS		16							32	
14 DIOPATRA CUPREA	32					16				
15 MEDIOMASTUS CALIFORNIENSIS	32									
16 SIGAMBRA WASSI	32									
17 COROPHIUM ACHERUSICUM	32									
18 GLYCERA AMERICANA					16	16				
19 PRIONOSPIO CIRRIFERA										32
20 SPIOCARCINUS LOBATUS		32								
21 ANACHIS OBESA	16									
22 ANCISTROSYLLIS JONESI	16									
23 ANADARA TRANSVERSA		16								
24 NASSARIUS ACUTUS		16								
25 NEREIS SUCCINEA	16									
26 PINNIXA CRISTATA		16								
27 STYLOCHUS ELLIPTICUS	16									
28 ARICIDEA SP	16									
29 AMPHARETE (EYES)		16								
30 PAGURUS ANNULIPES	16									
31 SQUILLA EMPUSA		16								
32 OWENIA FUSIFORMIS						16				
33 PSEUDEURYTHOE AMBIGUA					16					
34 ABRA AEQUALIS										16
35 STHENELAIS BOA									16	
36 ARMANDIA AGILIS										16
37 MICROPHOLIS ATRA										16
38 AMPITHOE SP		16								
39 STENOTHOE SP					16					
TOTAL NUMBER OF INDIVIDUALS	720	336			496	496			736	416

TABLE E129
EXPERIMENTAL STUDY BENTHIC DATA: POST-DISPOSAL PHASE SAMPLES.
NUMBER OF INDIVIDUALS/SQ.M. OF EACH SPECIES COLLECTED AT STATION 2-3 ON 24 MAY 76

SURF TEMP	SURF SAL	BOT TEMP	BOT SAL	DEPTH	SED TEMP	TIME ON	TIME OFF
26.5	25.0	24.0	29.0	10.0	25.5	1440	1510

SEDIMENTS: HARD SAND WITH LITTLE MUD

SPECIES	REPLICATES									
	1		2		3		4		5	
	ADLT	YNG	ADLT	YNG	ADLT	YNG	ADLT	YNG	ADLT	YNG
1 REPLICATES NOT ANALYZED			****	****			****	****		
2 MEDIOMASTUS CALIFORNIENSIS					256				160	
3 GLYCINDE SOLITARIA		48				64				192
4 PRIONOSPIO PINNATA	64	16			16				112	32
5 OXYURCSTYLIS SALINOI	64								160	
6 GLYCERA AMERICANA										208
7 MAGELONA SP	32				16				144	
8 NEREIS SP	32				48				112	
9 LUMBRINERIS TENUIS		16				80			16	64
10 NEMERTEA (YELLOW BANDED)					16				128	
11 BALANOGLOSSUS						16				80
12 SIGAMBRA TENTACULATA					80				16	
13 NEMERTEA (WHITE)	32				48					
14 SPIOPHANES BOMBYX					16				32	16
15 THARYX SETIGERA					48					
16 CEREBRATULUS LACTEUS	16					16				
17 ABRA AEQUALIS						16				16
18 PRIONOSPIO DAYI					16				16	
19 COROPHIUM ACHERUSICUM						32				
20 SPIOCARCINUS LOBATUS						32				
21 AMPELISCA ABDITA										32
22 NOTOMASTUS LATERICEUS									32	
23 SOLEN VIRIDIS										32
24 ANAITIDES ERYTHROPHYLLUS		16								
25 NEMERTEA (YELLOW & PURPLE)					16					
26 NEREIS SUCCINEA					16					
27 EUCERAMUS PRAELONGUS					16					
28 BATEA CARTHARINENSIS					16					
29 AGLAOPHAMUS VERRILLI									16	
30 NATICA PUSILLA										16
31 SCOLEPSIS SQUAMATA										16
32 PRIONOSPIO CIRRIFERA										16
33 MONOCULODES SP									16	
34 MICROPHOLIS ATRA										16
TOTAL NUMBER OF INDIVIDUALS	240	96			624	256			960	736

TABLE E130
EXPERIMENTAL STUDY BENTHIC DATA: POST-DISPOSAL PHASE SAMPLES.
NUMBER OF INDIVIDUALS/SQ.M. OF EACH SPECIES COLLECTED AT STATION 2-4 ON 24 MAY 76

SURF TEMP	SURF SAL	BOT TEMP	BOT SAL	DEPTH	SED TEMP	TIME ON	TIME OFF
26.0	29.0	25.0	31.0	10.0	25.0	1410	1430

SEDIMENTS: 2 CM OXIDIZED MUD OVER SANDY MUD & GRAY CLAY

SPECIES	REPLICATES									
	1		2		3		4		5	
	ADLT	YNG	ADLT	YNG	ADLT	YNG	ADLT	YNG	ADLT	YNG
1 REPLICATES NOT ANALYZED			****	****			****	****		
2 PRIONOSPIO PINNATA	432	32			224	112			304	64
3 GLYCERA AMERICANA	16	48			16	144			48	32
4 MAGELONA SP	96				32				160	
5 MEDIOMASTUS CALIFORNIENSIS	112				16				128	
6 SIGAMBRA TENTACULATA	80				48	16			64	16
7 NEMERTEA (YELLOW BANDED)	48	32			48				80	
8 LUMBRINERIS TENUIS		64			16	16				32
9 CEREBRATULUS LACTEUS	32								16	16
10 COSSURA DELTA	16				32					
11 NEREIS SP					32				16	
12 NINOE NIGRIPES					16				16	
13 COROPHIUM ACHERUSICUM						32				
14 CEREBRATULUS LURIDUS										32
15 AMPELISCA ABDITA		16								
16 NOTOMASTUS LATERICEUS	16									
17 GYPTIS VITTATA	16									
18 PHASCOLION STROMBI	16									
19 OXYUROSTYLIS SALINOI	16									
20 ANCISTROSYLLIS JONESI					16					
21 HEMIPHOLIS ELONGATA						16				
22 NEMERTEA (YELLOW & PURPLE)					16					
23 NUCULANA CONCENTRICA					16					
24 PRIONOSPIO CIRRIFERA					16					
25 MAGELONA ROSEA					16					
26 STYLOCHUS ELLIPTICUS					16					
27 CLYMENELLA ZONALIS									16	
28 NOTOMASTUS HEMIPODUS										16
29 PSEUDEURYTHOE AMBIGUA									16	
30 SIGAMBRA WASSI									16	
31 SPIOCHAETOPTERUS OCULATUS	16									
32 DIOPATRA CUPREA										
TOTAL NUMBER OF INDIVIDUALS	912	192			576	336			880	208

TABLE E131
EXPERIMENTAL STUDY BENTHIC DATA: POST-DISPOSAL PHASE SAMPLES.
NUMBER OF INDIVIDUALS/SQ.M. OF EACH SPECIES COLLECTED AT STATION 2-5 ON 24 MAY 76

SURF TEMP	SURF SAL	BOT TEMP	BOT SAL	DEPTH	SED TEMP	TIME ON	TIME OFF
26.0	29.0	25.0	31.0	10.0	25.0	1345	1405

SEDIMENTS: 5 CM FINE SAND OVER SANDY MUD

SPECIES	REPLICATES									
	1		2		3		4		5	
	ADLT	YNG	ADLT	YNG	ADLT	YNG	ADLT	YNG	ADLT	YNG
1 REPLICATES NOT ANALYZED			****	****			****	****		
2 MAGELONA SP	64				64				720	
3 PRIONOSPIO PINNATA	208	32			224	32			48	16
4 GLYCINDE SOLITARIA		192				208				48
5 MEDIOMASTUS CALIFORNIENSIS	176				32				32	
6 NEMERTEA (YELLOW BANDED)	64	32			16				80	
7 OXYUROSTYLIS SALINOI	64				16				96	
8 LUMBRINERIS TENUIS		48				16				96
9 MICROPHOLIS ATRA										128
10 AMPELISCA ABDITA		16				16			64	
11 CEREBRATULUS LACTEUS		32			16				16	32
12 NOTOMASTUS LATERICEUS	32				32				32	
13 NEREIS SUCCINEA					16				64	
14 ABRA AEQUALIS		64								
15 NEREIS SP	16				48					
16 SIGAMBRA TENTACULATA	16								32	16
17 SPIOPHANES BOMBYX	16								48	
18 HEMIPHOLIS ELONGATA						32				32
19 DIOPATRA CUPREA		16			32					
20 GLYCERA AMERICANA					16				16	16
21 PSEUDEURYTHOE AMBIGUA	16				16					
22 MONOCULODES SP	16								16	
23 OWENIA FUSIFORMIS		16								
24 AMPHARETE (EYES)	16									
25 POLYDORA SOCIALIS	16									
26 TELLINA ALTERNATA		16								
27 STREBLOSPIO BENEDICTI					16					
28 BUNODACTIS TEXENSIS						16				
29 AGLAOPHAMUS VERRILLI									16	
30 NATICA PUSILLA									16	
31 NUCULANA CONCENTRICA									16	
32 NEPHTYS PICTA									16	
33 SPIOCHAETOPTERUS OCULATUS									16	
34 THYONE BRIAREUS									16	
35 TELLINA VERSICOLOR										16
36 NEMATODA									16	
37 DOSINIA DISCUS										16
38 PHOTIS SP.									16	
TOTAL NUMBER OF INDIVIDUALS	720	464			544	320			1392	416

TABLE E132
EXPERIMENTAL STUDY BENTHIC DATA: POST-DISPOSAL PHASE SAMPLES.
NUMBER OF INDIVIDUALS/SQ.M. OF EACH SPECIES COLLECTED AT STATION 15-1 ON 25 MAY 76

SURF TEMP	SURF SAL	BOT TEMP	BOT SAL	DEPTH	SED TEMP	TIME ON	TIME OFF
26.5	29.0	24.5	33.0	10.0	25.0	1415	1500

SEDIMENTS: HARD SAND WITH SOME MUD

SPECIES	REPLICATES									
	1		2		3		4		5	
	ADLT	YNG	ADLT	YNG	ADLT	YNG	ADLT	YNG	ADLT	YNG
1 REPLICATES NOT ANALYZED			****	****			****	****		
2 MEDIOMASTUS CALIFORNIENSIS	224				176				304	
3 MAGELONA SP	112				240				336	
4 PRIONOSPIO PINNATA					64	48			16	96
5 DIOPATRA CUPREA	16				64				64	
6 GLYCERA AMERICANA	16				16	32			16	48
7 LUMBRINERIS TENUIS		16				32			16	64
8 GLYCINDE SOLITARIA		48				16				16
9 SPIOPHANES BOMBYX		64								
10 NEMERTEA (YELLOW BANDED)		16			16				16	
11 CEREBRATULUS LACTEUS	32									
12 SIGAMBRA TENTACULATA	16	16								
13 ELECTRA SP (COLONIES)	32									
14 NEREIS SP									32	
15 BALANOGLOSSUS		16								
16 PHORONIS ARCHITECTA	16									
17 STYLOCHUS ELLIPTICUS	16									
18 PAGURUS ANNULIPES	16									
19 PARANTHUS RAPIFORMIS		16								
20 OXYUROSTYLIS SALINOI		16								
21 NOTOMASTUS HEMIPODUS					16					
22 SPIOCARCINUS LOBATUS						16				
TOTAL NUMBER OF INDIVIDUALS	496	208			592	144			800	224

TABLE E133
EXPERIMENTAL STUDY BENTHIC DATA: POST-DISPOSAL PHASE SAMPLES.
NUMBER OF INDIVIDUALS/SQ.M. OF EACH SPECIES COLLECTED AT STATION 15-2 ON 25 MAY 76

SURF TEMP	SURF SAL	BOT TEMP	BOT SAL	DEPTH	SED TEMP	TIME ON	TIME OFF
26.0	29.0	24.5	32.0	10.0	25.0	1335	1410

SEDIMENTS: 2-3 CM HARD SAND OVER MUDDY SAND

SPECIES	REPLICATES									
	1		2		3		4		5	
	ADLT	YNG	ADLT	YNG	ADLT	YNG	ADLT	YNG	ADLT	YNG
1 REPLICATES NOT ANALYZED			****	****			****	****		
2 MEDIOMASTUS CALIFORNIENSIS	352	16			80				64	
3 MAGELONA SP	192				16					
4 MAGELONA RIOJAI	16				144	16				
5 NEMERTEA (YELLOW BANDED)	32	32			48	16			32	16
6 PRIONOSPIO DAYI	96				16	16			32	
7 GLYCINDE SOLITARIA	32	80							16	
8 OXYUROSTYLIS SALINOI	32	16			16	32			16	
9 GLYCERA AMERICANA	16	48							16	32
10 SPIOPHANES BOMBYX	16	64							32	
11 SCOLEPSIS SQUAMATA					48	48				
12 NEPHTYS PICTA	32	16			32					
13 PRIONOSPIO PINNATA	16	16				16				16
14 THARYX SETIGERA	16				16				32	
15 PAGURUS ANNULIPES	16					16				16
16 AMPELISCA ABDITA	32				16					
17 NEREIS SP	48									
18 COROPHIUM ACHERUSICUM	32	16								
19 ANAITIDES ERYTHROPHYLLUS	16				16					
20 NATICA PUSILLA		16			16					
21 OWENIA FUSIFORMIS		32								
22 NEMERTEA (WHITE)		16								16
23 AMPHARETE (EYES)	32									
24 ELASMOPUS RAPAX	32									
25 BALANOGLOSSUS					16	16				
26 PARANTHUS RAPIFORMIS						32				
27 ABRA AEQUALIS		16								
28 NOTOMASTUS LATERICEUS	16									
29 HEMIPHOLIS ELONGATA		16								
30 SIGAMBRA TENTACULATA	16									
31 NEMATODA	16									
32 SOLEN VIRIDIS	16									
33 TELLINIDAE	16									
34 AGLAOPHAMUS VERRILLI						16				
35 LUMBRINERIS TENUIS						16				
36 OGYRIDES LIMICOLA					16					
37 SCOLOPLOS (LEODAMUS) RUBRA					16					
38 MULINIA LATERALIS										16
39 STHENELAIS BOA										16
TOTAL NUMBER OF INDIVIDUALS	1136	400			512	240			240	128

TABLE E134
EXPERIMENTAL STUDY BENTHIC DATA: POST-DISPOSAL PHASE SAMPLES.
NUMBER OF INDIVIDUALS/SQ.M. OF EACH SPECIES COLLECTED AT STATION 15-3 ON 25 MAY 76

SURF TEMP	SURF SAL	BOT TEMP	BOT SAL	DEPTH	SED TEMP	TIME ON	TIME OFF
27.0	28.0	25.0	33.0	10.0	25.0	1205	1245

SEDIMENTS: 2-3 CM OXIDIZED SANDY MUD OVER SANDY GRAY CLAY

SPECIES	REPLICATES									
	1		2		3		4		5	
	ADLT	YNG	ADLT	YNG	ADLT	YNG	ADLT	YNG	ADLT	YNG
1 REPLICATES NOT ANALYZED			****	****			****	****		
2 MEDIOMASTUS CALIFORNIENSIS	160				256	32			80	
3 MAGELONA SP	160				160				80	
4 CEREBRATULUS LACTEUS	128	32			48	32				
5 LUMBRINERIS TENUIS		8C				80				48
6 GLYCERA AMERICANA		32			32	128				16
7 SPIOPHANES BOMBYX	16				16				128	16
8 AMPELISCA ABDITA	16				16	64			48	16
9 NEMERTEA (YELLOW BANDED)		48				16				80
10 COROPHIUM ACHERUSICUM	32	16							48	32
11 OXYURCSTYLIS SALINOI	48				16	32			16	
12 GLYCINDE SOLITARIA						16			16	80
13 SIGAMBRA WASSI	64				16				16	
14 HEMIPHOLIS ELONGATA										96
15 PHORONIS ARCHITECTA	16				32				32	
16 PAGURUS ANNULIPES	32	32							16	
17 ABRA AEQUALIS		32								32
18 COSSURA DELTA	48	16								
19 NEREIS SUCCINEA	32	16								
20 SOLEN VIRIDIS	16					16			16	
21 PINNIXA CRISTATA						48				
22 TELLINA VERSICOLOR						48				
23 CLYMENELLA ZONALIS	32									
24 NEMERTEA (YELLOW & PURPLE)		16				16				
25 PRIONOSPIO PINNATA	16	16								
26 MICROPANOPE NUTTINGI	16									16
27 ANCISTROSYLLIS JONESI						16				16
28 AGLAOPHAMUS VERRILLI										32
29 ANADARA TRANSVERSA	16									
30 DIOPATRA CUPREA	16									
31 NOTOMASTUS LATERICEUS	16									
32 OWENIA FUSIFORMIS	16									
33 NEMATODA	16									
34 PARANTHUS RAPIFORMIS	16									
35 EUCERAMUS PRAELONGUS	16									
36 MERCENARIA MERCENARIA		16								
37 SIGAMBRA TENTACULATA					16					
38 GYPTIS VITTATA					16					
39 STYLOCHUS ELLIPTICUS					16					
40 VITRINELLA HELICOIDEA					16					
41 NOTOMASTUS HEMIPODUS										16
42 ELASMOPUS RAPAX									16	
43 NEREIS SP					16					
TOTAL NUMBER OF INDIVIDUALS	944	352			672	544			512	496

TABLE E135

EXPERIMENTAL STUDY BENTHIC DATA: POST-DISPOSAL PHASE SAMPLES.

NUMBER OF INDIVIDUALS/SQ.M. OF EACH SPECIES COLLECTED AT STATION 15-4 ON 25 MAY 76

SURF TEMP	SURF SAL	BOT TEMP	BOT SAL	DEPTH	SED TEMP	TIME ON	TIME OFF
26.5	29.0	24.5	33.0	10.0	25.0	1315	1330

SEDIMENTS: 1-2 CM OXIDIZED SILT OVER SANDY GRAY CLAY

SPECIES	REPLICATES									
	1		2		3		4		5	
	ADLT	YNG	ADLT	YNG	ADLT	YNG	ADLT	YNG	ADLT	YNG
1 REPLICATES NOT ANALYZED			****	****			****	****		
2 MEDIOMASTUS CALIFORNIENSIS	80				1008				240	
3 MAGELONA SP	64				256				128	
4 LUMBRINERIS TENUIS		64			16	112				112
5 PHORONIS ARCHITECTA					128				112	
6 NEREIS SP	96	16			80				32	
7 PRIONOSPIO PINNATA	144	32			48					
8 CEREBRATULUS LACTEUS	16	16			48	32			32	32
9 NEMERTEA (YELLOW BANDED)		48				112				16
10 HEMIPHOLIS ELONGATA		16			64	48				32
11 AMPELISCA ABDITA		16			32	64				32
12 PRIONOSPIO CIRRIFERA					144					
13 GLYCERA AMERICANA	16	16			16	48				32
14 GLYCINDE SOLITARIA						96				32
15 NATICA PUSILLA	16					16			32	16
16 OXYUROSTYLIS SALINOI	16	16			16	16				
17 CLYMENELLA ZONALIS	32				16					
18 NOTOMASTUS LATERICEUS	16				16				16	
19 PRIONOSPIO DAYI	16	16				16				
20 COSSURA DELTA						48				
21 SIGAMBRA TENTACULATA					16	32				
22 BATEA CARTHARINENSIS	16				16					
23 ANCISTROSYLLIS JONESI						32				
24 BALANOGLOSSUS					16	16				
25 PARANTHUS RAPIFORMIS					32					
26 COROPHIUM ACHERUSICUM					32					
27 PAGURUS ANNULIPES						16			16	
28 MERCENARIA MERCENARIA						16				16
29 BUNODACTIS TEXENSIS		16								
30 GYPTIS VITTATA	16									
31 LISTRIELLA SP	16									
32 DIOPATRA CUPREA					16					
33 LEPIDASTHENIA SP					16					
34 NEMERTEA (YELLOW & PURPLE)					16					
35 NEREIS SUCCINEA						16				
36 MALACOCEROS SP					16					
37 SPIOPHANES BOMBYX					16					
38 TELLINA VERSICOLOR						16				
39 NEPHTYS INCISA						16				
40 MELINNA MACULATA					16					
41 CREPIDULA SP						16				
42 BUSYCON CONTRARIUM										16
43 XANTHIDAE										16
44 PISTA PALMATA									16	
45 EDWARDSIA SP									16	
46 NEMATODA									16	
TOTAL NUMBER OF INDIVIDUALS	560	272			2096	784			656	352

TABLE E136
EXPERIMENTAL STUDY BENTHIC DATA: POST-DISPCSAL PHASE SAMPLES.
NUMBER OF INDIVIDUALS/SQ.M. OF EACH SPECIES COLLECTED AT STATION 15-5 ON 25 MAY 76

SURF TEMP	SURF SAL	BOT TEMP	BCT SAL	DEPTH	SED TEMP	TIME ON	TIME OFF
26.0	29.0	24.5	33.0	10.0	25.0	1255	1305

SEDIMENTS: 2-3 CM SAND OVER SANDY GRAY CLAY

SPECIES	REPLICATES									
	1		2		3		4		5	
	ADLT	YNG	ADLT	YNG	ADLT	YNG	ADLT	YNG	ADLT	YNG
1 REPLICATES NOT ANALYZED			****	****			****	****		
2 MEDIOMASTUS CALIFORNIENSIS	656				656				544	16
3 NEREIS SP	80	32			112	48			160	
4 COROPHIUM ACHERUSICUM		80			80	96			96	80
5 MAGELONA SP	48				128				128	
6 NEREIS SUCCINEA	64	80				16			64	32
7 PAGURUS ANNULIPES	48	128			16	16			16	
8 GLYCERA AMERICANA	16	32			16	64				64
9 LUMBRINERIS TENUIS		64			16	48				64
10 PRIONCSPIO CIRRIFERA		32				160				
11 NEMERTEA (YELLOW BANDED)	16	48				32				64
12 OXYURCSTYLIS SALINOI	48	48			48					
13 HEMIPHOLIS ELONGATA		96				32				16
14 AMPELISCA ABDITA	16	48			32	16			16	
15 CEREBRATULUS LACTEUS	32					16			32	48
16 DIOPATRA CUPREA	16	16				32			64	
17 PRIONOSPIO PINNATA	16	32			32	16				
18 GLYCINDE SOLITARIA		32			16	16				16
19 PHORONIS ARCHITECTA									64	
20 ABRA AEQUALIS		16				32				
21 COSSURA DELTA		16			32					
22 SPIOCHAETOPTERUS OCULATUS	32				16					
23 TELLINA VERSICOLOR		32								16
24 PRIONCSPIO DAYI		16				32				
25 SPIOCARCINUS LOBATUS		16				32				
26 NEMERTEA (YELLOW & PURPLE)		32								
27 NOTOMASTUS LATERICEUS	16	16								
28 LEPIDONOTUS SUBLEVIS		16				16				
29 BATEA CARTHARINENSIS	32									
30 ELASMOPUS RAPAX	16				16					
31 PSEUDEURYTHOE AMBIGUA					16				16	
32 OWENIA FUSIFORMIS	16									
33 SIGAMBRA TENTACULATA	16									
34 NEPHTYS INCISA	16									
35 MAGELONA ROSEA	16									
36 MULINIA LATERALIS	16									
37 ELECTRA SP (COLONIES)	16									
38 ANADARA TRANSVERSA						16				
39 LEPIDASTHENIA SP					16					
40 PINNIXA CRISTATA						16				
41 SCOLEPSIS SQUAMATA						16				
42 SPIOPHANES BOMBYX						16				
43 PARANTHUS RAPIFORMIS										16
44 CIRRATULUS HEDGPETHI									16	
45 MESOCHAETOPTERUS TAYLORI									16	
46 MALACOCEROS SP										16
TOTAL NUMBER OF INDIVIDUALS	1248	928			1248	784			1232	448

TABLE E137
EXPERIMENTAL STUDY BENTHIC DATA: POST-DISPOSAL PHASE SAMPLES.
NUMBER OF INDIVIDUALS/SQ.M. OF EACH SPECIES COLLECTED AT STATION 14-1 ON 14 MAY 76

SURF TEMP	SURF SAL	BOT TEMP	BOT SAL	DEPTH	SED TEMP	TIME ON	TIME OFF
25.0	25.0	23.5	30.0	14.5	23.0	800	830

SEDIMENTS: SHELL HASH OVER GRAY CLAY. BEAUMONT CLAY IN SAMPLES C, D & E

SPECIES	REPLICATES									
	1		2		3		4		5	
	ADLT	YNG	ADLT	YNG	ADLT	YNG	ADLT	YNG	ADLT	YNG
1 REPLICATES NOT ANALYZED			****	****			****	****		
2 NEREIS SUCCINEA	192				64				256	32
3 LUMBRINERIS TENUIS	32	128			48	144			16	64
4 ABRA AEQUALIS	32				144	32			48	
5 NEPHTYS PICTA	176				16	16			16	
6 PHORONIS ARCHITECTA	64				144					
7 NEREIS SP	80	16			32				16	16
8 NEMERTEA (YELLOW BANDED)	32				128					
9 AMPELISCA ABDITA	16	32			32	16				64
10 AGLAOPHAMUS VERRILLI					112	16				
11 PRIONOSPIO PINNATA					48				48	16
12 CEREBRATULUS LACTEUS	48				16	16			16	
13 COROPHIUM ACHERUSICUM					16	32			48	
14 GLYCERA AMERICANA	16	32				16				
15 SPIOPHANES BOMBYX	16				32	16				
16 NEOPANOPE TEXANA		32							16	16
17 PINNIXA CRISTATA		16				32				
18 MICROPHOLIS ATRA	16				16				16	
19 MAGELONA SP					16				32	
20 CIRRATULUS HEDGPETHI					16				32	
21 AMPHIPODA, UN ID									48	
22 PHOTIS SP.					32	16				
23 NOTOMASTUS LATERICEUS	16				16					
24 GLYCINDE SOLITARIA						16				16
25 BALANOGLOSSUS						32				
26 AMPHARETE ACUTIFRONS					16				16	
27 ANADARA TRANSVERSA	16									
28 DIOPATRA CUPREA	16									
29 EUCERAMUS PRAELONGUS	16									
30 CORBULA BARRATTANIA	16									
31 CLYMENELLA ZONALIS					16					
32 ARICIDEA SP					16					
33 AMPHARETE (EYES)					16					
34 TELLINA VERSICOLOR					16					
35 STYLOCHUS ELLIPTICUS					16					
36 STHENELAIS BOA						16				
TOTAL NUMBER OF INDIVIDUALS	800	256			1024	416			624	224

TABLE E138
EXPERIMENTAL STUDY BENTHIC DATA: POST-DISPOSAL PHASE SAMPLES.
NUMBER OF INDIVIDUALS/SQ.M. OF EACH SPECIES COLLECTED AT STATION 14-2 ON 14 MAY 76

SURF TEMP	SURF SAL	BOT TEMP	BOT SAL	DEPTH	SED TEMP	TIME ON	TIME OFF
25.0	24.0	24.0	28.0	14.5	23.0	835	1100

SEDIMENTS: 1-2 CM OXIDIZED MUD OVER 6-7 CM CLAY & LARGE SHELL OVER GRAY CLAY

SPECIES	REPLICATES									
	1		2		3		4		5	
	ADLT	YNG	ADLT	YNG	ADLT	YNG	ADLT	YNG	ADLT	YNG
1 REPLICATES NOT ANALYZED			****	****			****	****		
2 BALANOGLOSSUS		688				432				
3 LUMBRINERIS TENUIS	32	176				128			48	80
4 AMPELISCA ABDITA	16					32			240	144
5 MAGELONA SP	80				144				112	
6 CEREBRATULUS LACTEUS		16			32	64				48
7 PRIONOSPIO PINNATA	64	16			16	32			16	16
8 NUCULANA CONCENTRICA									48	80
9 PINNIXA CRISTATA	32				16	32				16
10 GIANT SPERM	16				32				48	
11 NEMATODA					96					
12 NINOE NIGRIPES					48				32	
13 MEDIOMASTUS CALIFORNIENSIS					64					
14 LEPIDONOTUS SUBLEVIS	16					32			16	
15 GLYCERA AMERICANA					16	32			16	
16 AMPHARETE (EYES)		32								16
17 NEMERTEA (YELLOW BANDED)					16				32	
18 PHORONIS ARCHITECTA									48	
19 GLYCINDE SOLITARIA						48				
20 PHOTIS SP.					16					32
21 DIOPATRA CUPREA	16	16								
22 ARMANDIA AGILIS	16					16				
23 SIGAMBRA TENTACULATA						32				
24 CLYMENELLA ZONALIS									32	
25 NEMERTEA (WHITE)									32	
26 COROPHIUM ACHERUSICUM									32	
27 SIGAMBRA WASSI		16								
28 ARICIDEA SP		16								
29 CALLIANASSA ACANTHOCHIRUS		16								
30 ALPHEUS FLORIDANUS		16								
31 CORBULA BARRATTANIA	16									
32 ANAITIDES ERYTHROPHYLLUS						16				
33 STYLOCHUS ELLIPTICUS					16					
34 LISTRIELLA SP					16					
35 NEREIS SP									16	
36 PISTA CRISTATA									16	
37 LOVENELLA GRACILIS (COL)									16	
38 TELLINA VERSICOLOR										16
TOTAL NUMBER OF INDIVIDUALS	304	1008			528	896			800	448

TABLE E139
EXPERIMENTAL STUDY BENTHIC DATA: POST-DISPOSAL PHASE SAMPLES.
NUMBER OF INDIVIDUALS/SQ.M. OF EACH SPECIES COLLECTED AT STATION 14-3 ON 14 MAY 76

SURF TEMP	SURF SAL	BOT TEMP	BOT SAL	DEPTH	SED TEMP	TIME ON	TIME OFF
25.0	25.0	24.0	29.0	13.5	23.5	1105	1135

SEDIMENTS: 2-3 CM MUDDY SAND & SHELL HASH OVER SANDY MUD WITH SMALL SHELL & BEAUMONT CLAY

SPECIES	REPLICATES									
	1		2		3		4		5	
	ADLT	YNG	ADLT	YNG	ADLT	YNG	ADLT	YNG	ADLT	YNG
1 REPLICATES NOT ANALYZED			****	****			****	****		
2 PHORONIS ARCHITECTA	400				240				96	
3 LUMBRINERIS TENUIS	16	176			16	192			48	224
4 PAGURUS ANNULIPES	160	48			144	16				
5 PINNIXA CRISTATA						16			208	96
6 CEREBRATULUS LACTEUS		16			32	16			16	176
7 NEREIS SUCCINEA	64								160	16
8 MAGELONA SP	192				16				16	
9 PRIONOSPIO PINNATA	16				48	16			64	80
10 BALANOGLOSSUS									176	32
11 GLYCERA AMERICANA					16	16			80	64
12 AMPELISCA ABDITA						128			16	16
13 NEMERTEA (YELLOW BANDED)	32				64				32	
14 NUCULANA CONCENTRICA	32				16	16			48	
15 AMPHARETE ACUTIFRONS	96				16					
16 NEREIS SP	32				48				16	
17 AGLAOPHAMUS VERRILLI	64									16
18 GLYCINDE SOLITARIA	16	32								32
19 ANAITIDES ERYTHROPHYLLUS		16				64				
20 NINOE NIGRIPES					64				16	
21 CLYMENELLA ZONALIS	16								48	
22 CIRRATULUS HEDGPETHI	48								16	
23 LEPIDASTHENIA SP									64	
24 NOTOMASTUS LATERICEUS	16				32					
25 COSSURA DELTA						16				32
26 OWENIA FUSIFORMIS	32									
27 PRIONOSPIO CIRRIFERA		32								
28 STHENELAIS BOA	16	16								
29 POLYDORA SOCIALIS	16				16					
30 CLYMENELLA TORQUATA CALIDA					32					
31 MICROPHOLIS ATRA						16			16	
32 ABRA AEQUALIS	16									
33 MEGALOMMA BIOCULATUM	16									
34 PRIONOSPIO DAYI		16								
35 TELLINA ALTERNATA		16								
36 SIGAMBRA TENTACULATA						16				
37 NEMERTEA (WHITE)					16					
38 BASCANICHTHYS TERES									16	
39 AUTOMATE EVERMANNI									16	
40 DIPLODONTA SP									16	
41 BATEA CARTHARINENSIS									16	
42 PHOTIS SP.						16				
TOTAL NUMBER OF INDIVIDUALS	1296	368			816	544			1200	784

TABLE E140
EXPERIMENTAL STUDY BENTHIC DATA: POST-DISPOSAL PHASE SAMPLES.
NUMBER OF INDIVIDUALS/SQ.M. OF EACH SPECIES CCLLECTED AT STATION 14-4 ON 24 MAY 76

SURF TEMP	SURF SAL	BOT TEMP	BOT SAL	DEPTH	SED TEMP	TIME ON	TIME OFF
25.5	28.0	24.5	29.0	14.5	24.0	800	835

SEDIMENTS: 1 CM OXIDIZED SILT OVER 4 CM GRAY CLAY OVER SHELL CVER SOLID GRAY CLAY

SPECIES	REPLICATES									
	1		2		3		4		5	
	ADLT	YNG	ADLT	YNG	ADLT	YNG	ADLT	YNG	ADLT	YNG
1 REPLICATES NOT ANALYZED			****	****			****	****		
2 BALANOGLOSSUS		496				192				304
3 PRIONOSPIO PINNATA	48	80			112	64			64	16
4 MAGELONA SP	128				16				80	
5 LUMBRINERIS TENUIS		48			16	16			32	48
6 ALBUNEA PARETII					64				32	16
7 CEREBRATULUS LACTEUS	16	16							16	48
8 SIGAMBRA WASSI	96									
9 GLYCINDE SOLITARIA		16				16				32
10 ABRA AEQUALIS	32									
11 GLYCERA AMERICANA	16								16	
12 NEMERTEA (YELLOW BANDED)	16				16					
13 NEREIS SP	32									
14 NOTOMASTUS LATERICEUS	16								16	
15 NUCULANA CONCENTRICA	16				16					
16 SIGAMBRA TENTACULATA	16	16								
17 PRIONOSPIO CIRRIFERA		16								16
18 COROPHIUM ACHERUSICUM	32									
19 CIRRATULUS HEDGPETHI									32	
20 PINNIXA CRISTATA						16				
21 TELLINA IRIS									16	
22 LEPIDASTHENIA SP		16								
23 PHORONIS ARCHITECTA	16									
24 GYPTIS VITTATA		16								
25 PAGURUS ANNULIPES					16					
26 LAONOME SP.					16					
27 DIOPATRA CUPREA									16	
28 NINOE NIGRIPES									16	
29 OWENIA FUSIFORMIS										16
30 SPIOCHAETOPTERUS OCULATUS									16	
31 GIANT SPERM									16	
TOTAL NUMBER OF INDIVIDUALS	480	720			272	304			368	496

TABLE E141
EXPERIMENTAL STUDY BENTHIC DATA: POST-DISPOSAL PHASE SAMPLES.
NUMBER OF INDIVIDUALS/SQ.M. OF EACH SPECIES COLLECTED AT STATION 14-5 ON 24 MAY 76

SURF TEMP	SURF SAL	BOT TEMP	BOT SAL	DEPTH	SED TEMP	TIME ON	TIME OFF
25.5	28.0	24.5	29.0	14.5	25.0	845	930

SEDIMENTS: 2 CM OXIDIZED SANDY MUD OVER SANDY CLAY OVER GRAY CLAY

SPECIES	REPLICATES									
	1		2		3		4		5	
	ADLT	YNG	ADLT	YNG	ADLT	YNG	ADLT	YNG	ADLT	YNG
1 REPLICATES NOT ANALYZED			****	****			****	****		
2 PINNIXA CRISTATA	112	80			336	64				16
3 BALANOGLOSSUS	16	144			224	32				32
4 LUMBRINERIS TENUIS		48			32	112			32	176
5 CEREBRATULUS LACTEUS					48	176				48
6 PRIONOSPIO PINNATA	16				32	32			64	48
7 NEMERTEA (YELLOW BANDED)	16	16			64				16	
8 ASYCHIS ELONGATA					16	16			80	
9 NEREIS SP	16				16	16			32	
10 CLYMENELLA TORQUATA CALIDA	32								48	
11 NEMERTEA (WHITE)	64								16	
12 MAGELONA SP	16				32				16	
13 COSSURA DELTA		16								32
14 GLYCINDE SOLITARIA		16				16				16
15 LEPIDASTHENIA SP		16			16	16				
16 NINOE NIGRIPES	16				16				16	
17 NOTOMASTUS LATERICEUS	16				16				16	
18 SIGAMBRA WASSI	32								16	
19 DIOPATRA CUPREA					48					
20 STHENELAIS BOA					32					
21 ANATINA ANATINA		32								
22 OWENIA FUSIFORMIS	16									
23 PRIONOSPIO CIRRIFERA		16								
24 PISTA CRISTATA		16								
25 PHASCOLION STROMBI	16									
26 GLYCERA AMERICANA					16					
27 THARYX SETIGERA					16					
28 MAGELONA ROSEA					16					
29 BASCANICHTHYS TERES					16					
30 NEMATODA					16					
31 MICROPHOLIS ATRA						16				
32 CLYMENELLA ZONALIS									16	
33 MEDIOMASTUS CALIFORNIENSIS									16	
34 NUCULANA CONCENTRICA									16	
35 GYPTIS VITTATA										16
36 NEPHTYS PICTA									16	
37 ANEMONE (SAND ENCRUSTED)									16	
38 XANTHIDAE										16
39 STYLOCHUS ELLIPTICUS									16	
TOTAL NUMBER OF INDIVIDUALS	384	400			1008	496			448	400

TABLE E142
EXPERIMENTAL STUDY BENTHIC DATA: POST-DISPOSAL PHASE SAMPLES.
NUMBER OF INDIVIDUALS/SQ.M. OF EACH SPECIES COLLECTED AT STATION 12-1 ON 24 MAY 76

SURF TEMP	SURF SAL	BOT TEMP	BOT SAL	DEPTH	SED TEMP	TIME ON	TIME OFF
26.0	29.0	25.0	31.0	14.0	25.5	1300	1325

SEDIMENTS: 2 CM OXIDIZED MUD OVER SANDY MUD & GRAY CLAY

SPECIES	REPLICATES									
	1		2		3		4		5	
	ADLT	YNG	ADLT	YNG	ADLT	YNG	ADLT	YNG	ADLT	YNG
1 REPLICATES NOT ANALYZED			****	****			****	****		
2 LUMBRINERIS TENUIS	48	48			32	224				112
3 MAGELONA SP	96				160				64	
4 BALANOGLOSSUS					288					
5 PRIONOSPIO PINNATA	80				64	48			32	
6 CEREBRATULUS LACTEUS	16	16			16	128			16	
7 NEREIS SP	64				112				16	
8 PINNIXA CRISTATA					160	16				
9 NEMERTEA (YELLOW BANDED)	48	32			48				16	
10 GLYCERA AMERICANA	16					16			64	
11 GLYCINDE SOLITARIA		16				16				64
12 PRIONOSPIO CIRRIFERA						96				
13 NINOE NIGRIPES	32								48	
14 PSEUDEURYTHOE AMBIGUA					48	16			16	
15 ABRA AEQUALIS	16								32	
16 AMPELISCA ABDITA		16				16				16
17 NEMERTEA (WHITE)	32								16	
18 LEPIDONOTUS SUBLEVIS		16			16					
19 DIOPATRA CUPREA									32	
20 STYLOCHUS ELLIPTICUS									32	
21 PHOTIS SP.	16								16	
22 CLYMENELLA TORQUATA CALIDA	16									
23 COSSURA DELTA	16									
24 NOTOMASTUS LATERICEUS	16									
25 ARICIDEA SP	16									
26 MICROPHOLIS ATRA		16								
27 ODOSTOMIA GIBBOSA	16									
28 MAGELONA ROSEA	16									
29 ANCISTROSYLLIS JONESI					16					
30 LEPIDASTHENIA SP					16					
31 MEDIOMASTUS CALIFORNIENSIS					16					
32 NUCULANA CONCENTRICA					16					
33 SIGAMBRA WASSI					16					
34 GYPTIS VITTATA						16				
35 AGLAOPHAMUS VERRILLI										16
36 NEPHTYS PICTA									16	
37 ASYCHIS ELONGATA									16	
38 OXYUROSTYLIS SALINOI									16	
39 VOLVULELLA TEXASIANA									16	
40 COROPHIUM ACHERUSICUM									16	
41 AMPITHOE SP									16	
42 NEREIS SUCCINEA									16	
TOTAL NUMBER OF INDIVIDUALS	560	160			1024	592			512	208

TABLE E143
EXPERIMENTAL STUDY BENTHIC DATA: POST-DISPOSAL PHASE SAMPLES.
NUMBER OF INDIVIDUALS/SQ.M. OF EACH SPECIES COLLECTED AT STATION 12-2 ON 24 MAY 76

SURF TEMP	SURF SAL	BOT TEMP	BOT SAL	DEPTH	SED TEMP	TIME ON	TIME OFF
26.5	29.0	25.0	30.0	14.0	25.0	1230	1255

SEDIMENTS: 2 CM OXIDIZED MUD OVER SANDY GRAY CLAY. VERY COMPACT.

SPECIES	REPLICATES									
	1		2		3		4		5	
	ADLT	YNG	ADLT	YNG	ADLT	YNG	ADLT	YNG	ADLT	YNG
1 REPLICATES NOT ANALYZED			****	****			****	****		
2 MAGELONA SP	240				416				320	
3 PRIONOSPIO PINNATA	64	32			48	96			32	80
4 CEREBRATULUS LACTEUS	32	80			48	144			16	16
5 SIGAMBRA WASSI	128	32			48				48	32
6 LUMBRINERIS TENUIS					16	128				128
7 MEDIOMASTUS CALIFORNIENSIS	48				96				48	
8 LEPIDASTHENIA SP	16	128							16	
9 NEREIS SP	16				96				32	
10 GLYCINDE SOLITARIA		32				80				
11 MAGELONA ROSEA	32				48				16	
12 BALANOGLOSSUS	32	16							16	
13 NEMERTEA (YELLOW BANDED)	16									48
14 PINNIXA CRISTATA	64									
15 CLYMENELLA ZONALIS					64					
16 NINOE NIGRIPES					48				16	
17 AMPELISCA ABDITA		16				32				
18 GLYCERA AMERICANA	16				16				16	
19 GIANT SPERM	16				16				16	
20 HEMIPHOLIS ELONGATA									48	
21 COSSURA DELTA	16								16	
22 STHENELAIS BOA	16					16				
23 SIGAMBRA TENTACULATA									16	16
24 ASYCHIS ELONGATA					16				16	
25 DIOPATRA CUPREA	16									
26 NEREIS SUCCINEA	16									
27 CERATOCEPHALE SP.		16								
28 GYPTIS VITTATA	16									
29 LEPIDONOTUS SUBLEVIS	16									
30 MICROPHOLIS ATRA	16									
31 OXYUROSTYLIS SALINOI		16								
32 NOTOMASTUS LATERICEUS					16					
33 PARANTHUS RAPIFORMIS					16					
34 TELLINA VERSICOLOR						16				
35 NEMERTEA (WHITE)						16				
36 COROPHIUM ACHERUSICUM						16				
37 ABRA AEQUALIS										16
38 AMPHARETE ACUTIFRONS									16	
39 MYRIOWENIA CALIFORNIENSIS									16	
TOTAL NUMBER OF INDIVIDUALS	832	368			1008	544			720	336

TABLE E144
EXPERIMENTAL STUDY BENTHIC DATA: POST-DISPOSAL PHASE SAMPLES.
NUMBER OF INDIVIDUALS/SQ.M. OF EACH SPECIES COLLECTED AT STATION 12-3 ON 24 MAY 76

SURF TEMP	SURF SAL	BOT TEMP	BOT SAL	DEPTH	SED TEMP	TIME ON	TIME OFF
26.0	30.0	25.0	29.0	14.0	****	1100	1220

SEDIMENTS: 1,2,4,5: 6 CM SHELL HASH OVER SAND; SAMPLE 3: ALL SHELL HASH

SPECIES	REPLICATES									
	1		2		3		4		5	
	ADLT	YNG	ADLT	YNG	ADLT	YNG	ADLT	YNG	ADLT	YNG
1 REPLICATES NOT ANALYZED			****	****			****	****		
2 PAGURUS ANNULIPES	208	320			288	96			48	32
3 NEREIS SUCCINEA	80				112				240	
4 POLYGORDIUS SP.	64	80			80	64			16	32
5 PRIONOSPIO CIRRIFERA					176	64				48
6 ABRA AEQUALIS	64				144				64	16
7 CEREBRATULUS LACTEUS	16	16			32	144			16	
8 LUMBRINERIS TENUIS	16				16	96			16	48
9 STYLOCHUS ELLIPTICUS	16				128				32	
10 NEREIS SP	48				48				64	
11 NEPHTYS PICTA					96	16			16	
12 SIGAMBRA WASSI	64				48					
13 NEMERTEA (YELLOW BANDED)					48	32			32	
14 MEDIOMASTUS CALIFORNIENSIS					80				16	
15 POLYDORA SOCIALIS					32				48	16
16 BALANOGLOSSUS						64			16	16
17 ANAITIDES ERYTHROPHYLLUS	32				32	16				
18 HEMIPHOLIS ELONGATA		16				32				16
19 MAGELONA SP	16				48					
20 AMPELISCA ABDITA						32				32
21 CEREBRATULUS LURIDUS							48			
22 GLYCINDE SOLITARIA						32				16
23 PRIONOSPIO PINNATA					32	16				
24 SIGAMBRA TENTACULATA						48				
25 SPIOPHANES BOMBYX					48					
26 ANADARA TRANSVERSA										48
27 AMPITHOE SP					48					
28 PARAHESIONE LUTEOLA		16				32				
29 THARYX SETIGERA		32								
30 BRANCHIOSTOMA CARIBAEUM		16							16	
31 OWENIA FUSIFORMIS					32					
32 PISTA CRISTATA					32					
33 XANTHIDAE						16				16
34 DIOPATRA CUPREA									16	16
35 GLYCERA AMERICANA										32
36 LEPIDASTHENIA SP		16				16				
37 PHOTIS SP.		16							16	
38 PSEUDEURYTHOE AMBIGUA	16									
39 EUCERAMUS PRAELONGUS		16								
40 NEMERTEA (WHITE)		16								
41 PINNIXA CRISTATA						16				
42 SPIOCHAETOPTERUS OCULATUS					16					
43 PRIONOSPIO HETEROBRANCHIA					16					
44 STREBLOSPIO BENEDICTI					16					
45 PALEONOTUS HETEROSETA					16					
46 EUMIDA SANGUINEA					16					
47 PAGURUS POLLICARIS					16					
48 CREPIDULA PLANA					16					
49 PRIONOSPIO CIRROBRANCHIA									16	
50 COROPHIUM ACHERUSICUM										16
51 AMPHARETE (EYES)									16	
52 ARICIDEA SP						16				
53 ANCISTROSYLLIS JONESI						16				
TOTAL NUMBER OF INDIVIDUALS	640	560			1712	864	48		704	400

TABLE E145

EXPERIMENTAL STUDY BENTHIC DATA: POST-DISPOSAL PHASE SAMPLES.

NUMBER OF INDIVIDUALS/SQ.M. OF EACH SPECIES COLLECTED AT STATION 12-4 ON 24 MAY 76

SURF TEMP	SURF SAL	BOT TEMP	BOT SAL	DEPTH	SED TEMP	TIME ON	TIME OFF
26.0	29.0	25.0	31.0	14.0	25.5	1025	1100

SEDIMENTS: LARGE QUANTITIES OF SHELL HASH WITH SOME SAND

	SPECIES	REPLICATES 1		2		3		4		5	
		ADLT	YNG	ADLT	YNG	ADLT	YNG	ADLT	YNG	ADLT	YNG
1	REPLICATES NOT ANALYZED			****	****	****	****				
2	PAGURUS ANNULIPES	848	208					1728	176	288	48
3	POLYGORDIUS SP.	16	64					64		160	208
4	NEREIS SUCCINEA	128						112	16	144	64
5	ABRA AEQUALIS	160						16	48	160	32
6	ANADARA TRANSVERSA								208		32
7	AMPITHOE SP	112	48					64		16	
8	LUMBRINERIS TENUIS	48						32	80	32	16
9	PSEUDEURYTHOE AMBIGUA	144	64								
10	NEMERTEA (YELLOW BANDED)	16						80	16	64	16
11	STYLOCHUS ELLIPTICUS	128								48	
12	PRIONOSPIO CIRRIFERA		64						16	32	48
13	CEREBRATULUS LACTEUS		64					16	64		
14	GLYCERA AMERICANA	32	80						16	16	
15	NEREIS SP	80						32		32	
16	PRIONOSPIO PINNATA		16					32	64		32
17	AMPHARETE ACUTIFRONS	32						48	16	48	
18	NEMATODA	80						16		16	
19	XANTHIDAE		112								
20	NEPHTYS PICTA	16	16					32		16	
21	GYPTIS VITTATA		32								48
22	THARYX SETIGERA		32							32	
23	ANAITIDES ERYTHROPHYLLUS	16	32						16		
24	GIANT SPERM	32								16	
25	PISTA CRISTATA	16						32			
26	AMPHIPODA (RED EYES)	48									
27	SPIOPHANES BOMBYX	16								32	
28	POLYDORA SOCIALIS							32			16
29	SCOLEPSIS SQUAMATA							32		16	
30	CEREBRATULUS LURIDUS		16								16
31	NASSARIUS ACUTUS	16							16		
32	PINNIXA CRISTATA	16							16		
33	SIGAMBRA TENTACULATA	16									16
34	ARICIDEA SP	16						16			
35	LEPIDONOTUS SUBLEVIS	16								16	
36	LEPIDASTHENIA SP		16							16	
37	COROPHIUM ACHERUSICUM							16			16
38	DIOPATRA CUPREA							32			
39	HEMIPHOLIS ELONGATA								32		
40	MAGELONA SP							16		16	
41	ISOCHELES WURDEMANNI								32		
42	NEPHROPSIDAE		16							16	
43	PHOTIS SP.								32		
44	ASYCHIS ELONGATA	16						16			
45	CALLIANASSA ACANTHOCHIRUS	16									
46	GLYCINDE SOLITARIA		16								
47	NEOPANOPE TEXANA	16									
48	MAGELONA ROSEA	16									
49	PALEONOTUS HETEROSETA		16								
50	STHENELAIS BOA	16									
51	TELLINA VERSICOLOR		16								
52	MICROPHOLIS ATRA								16		
53	PAGURUS POLLICARIS								16		
54	PRIONOSPIO DAYI								16		
55	EUCERAMUS PRAELONGUS								16		
56	VITRINELLA HELICOIDEA							16			
57	AMPELISCA ABDITA										16
58	NEMERTEA (WHITE)									16	
59	MEDIOMASTUS CALIFORNIENSIS									16	
60	NOTOMASTUS LATERICEUS									16	
61	THYONE BRIAREUS										16
62	EUMIDA SANGUINEA									16	
63	BALANOGLOSSUS		16								
64	POLYDORA COMMENSALIS									16	
65	CHIONE SP		16								
66	PARAHESIONE LUTEOLA										16
	TOTAL NUMBER OF INDIVIDUALS	2128	960					2480	928	1312	656

TABLE E146
EXPERIMENTAL STUDY BENTHIC DATA: POST-DISPOSAL PHASE SAMPLES.
NUMBER OF INDIVIDUALS/SQ.M. OF EACH SPECIES COLLECTED AT STATION 12-5 ON 24 MAY 76

SURF TEMP	SURF SAL	BOT TEMP	BOT SAL	DEPTH	SED TEMP	TIME ON	TIME OFF
26.0	30.0	25.0	29.0	14.0	25.0	945	1020

SEDIMENTS: 2-3 CM OXIDIZED MUD OVER SANDY MUD & GRAY CLAY. SOME BEAUMONT CLAY

SPECIES	REPLICATES									
	1		2		3		4		5	
	ADLT	YNG	ADLT	YNG	ADLT	YNG	ADLT	YNG	ADLT	YNG
1 REPLICATES NOT ANALYZED			****	****			****	****		
2 LUMBRINERIS TENUIS		224				96			32	352
3 BALANOGLOSSUS	128	48			80				368	16
4 MAGELONA SP	256				128				176	
5 SIGAMBRA WASSI	64	48			64				80	
6 GLYCERA AMERICANA	64	32			64				64	16
7 PRIONOSPIO PINNATA		32				48			80	16
8 GLYCINDE SOLITARIA		48								112
9 CLYMENELLA ZONALIS	32	16			64				32	
10 NEREIS SUCCINEA	32				16				48	16
11 PSEUDEURYTHOE AMBIGUA	16				48				48	
12 SIGAMBRA TENTACULATA					16				80	16
13 LEPIDASTHENIA SP		48				32			16	
14 CEREBRATULUS LACTEUS					32	48				16
15 NEREIS SP	32				16	16				
16 NEMERTEA (YELLOW BANDED)									16	48
17 COSSURA DELTA									48	
18 PISTA CRISTATA									32	16
19 STHENELAIS BOA		16							16	
20 DIOPATRA CUPREA					16					16
21 NOTOMASTUS LATERICEUS					16				16	
22 NINOE NIGRIPES									16	16
23 PRIONOSPIO CIRRIFERA									16	16
24 MEDIOMASTUS CALIFORNIENSIS					16				16	
25 ANCISTROSYLLIS JONESI		16								
26 POLYDORA SOCIALIS	16									
27 SOLEN VIRIDIS		16								
28 TELLINA VERSICOLOR		16								
29 AMPHIPODA, UN ID	16									
30 VITRINELLA HELICOIDEA	16									
31 ASYCHIS ELONGATA					16					
32 BASCANICHTHYS TERES									16	
33 MICROPHOLIS ATRA										16
34 COROPHIUM ACHERUSICUM										16
35 PHOTIS SP.	16									
TOTAL NUMBER OF INDIVIDUALS	688	560			592	240			1216	704

TABLE E147
EXPERIMENTAL STUDY BENTHIC DATA: POST-DISPOSAL PHASE SAMPLES.
NUMBER OF INDIVIDUALS/SQ.M. OF EACH SPECIES COLLECTED AT STATION 27-1 ON 25 MAY 76

SURF TEMP	SURF SAL	BOT TEMP	BOT SAL	DEPTH	SED TEMP	TIME ON	TIME OFF
26.0	29.0	24.5	34.0	14.0	25.0	1105	1140

SEDIMENTS: 1 CM OXIDIZED MUD OVER GRAY CLAY

SPECIES	REPLICATES									
	1		2		3		4		5	
	ADLT	YNG	ADLT	YNG	ADLT	YNG	ADLT	YNG	ADLT	YNG
1 REPLICATES NOT ANALYZED			****	****			****	****		
2 MAGELONA SP	112				16				48	
3 CEREBRATULUS LACTEUS	32	96								
4 DIOPATRA CUPREA	64				16					
5 SIGAMBRA WASSI					16				32	
6 SIGAMBRA TENTACULATA						16				32
7 LUMBRINERIS TENUIS										48
8 BALANOGLOSSUS		16								16
9 NEREIS SP	32									
10 COSSURA DELTA	16									
11 PINNIXA CRISTATA		16								
12 PSEUDEURYTHOE AMBIGUA		16								
13 GYPTIS VITTATA	16									
14 PHOTIS SP.									16	
TOTAL NUMBER OF INDIVIDUALS	272	144			48	16			96	96

TABLE E148

EXPERIMENTAL STUDY BENTHIC DATA: POST-DISPOSAL PHASE SAMPLES.

NUMBER OF INDIVIDUALS/SQ.M. OF EACH SPECIES COLLECTED AT STATION 27-2 ON 25 MAY 76

SURF TEMP	SURF SAL	BOT TEMP	BOT SAL	DEPTH	SED TEMP	TIME ON	TIME OFF
26.5	29.0	24.5	34.0	14.0	25.0	1025	1055

SEDIMENTS: 2 CM OXIDIZED MUD OVER GRAY CLAY

SPECIES	REPLICATES									
	1		2		3		4		5	
	ADLT	YNG	ADLT	YNG	ADLT	YNG	ADLT	YNG	ADLT	YNG
1 REPLICATES NOT ANALYZED			****	****			****	****		
2 MAGELONA SP	64				240				48	
3 LUMBRINERIS TENUIS	32	96			16	64				32
4 SIGAMBRA WASSI	32				128				80	
5 CEREBRATULUS LACTEUS		32				144				16
6 GLYCINDE SOLITARIA		16				64				32
7 PHOTIS SP.					112					
8 BALANOGLOSSUS	96									
9 PRIONOSPIO PINNATA		48								32
10 DIOPATRA CUPREA	16				32				32	
11 AMPELISCA ABDITA		16			32					16
12 NEREIS SP		32			32					
13 PRIONOSPIO CIRRIFERA					48					
14 HEMIPHOLIS ELONGATA		16			16	16				
15 SIGAMBRA TENTACULATA		16			16					
16 COSSURA DELTA					32					
17 GLYCERA AMERICANA						16			16	
18 NINOE NIGRIPES					32					
19 CIRRATULUS HEDGPETHI					32					
20 CEREBRATULUS LURIDUS		16								
21 NUCULANA CONCENTRICA	16									
22 ARMANDIA AGILIS	16									
23 SPIOCARCINUS LOBATUS	16									
24 PAGURUS ANNULIPES	16									
25 BASCANICHTHYS TERES	16									
26 PHORONIS ARCHITECTA					16					
27 MAGELONA ROSEA					16					
28 VOLVULELLA TEXASIANA					16					
29 POLYDORA SOCIALIS					16					
30 AMPITHOE SP	16									
31 NEMERTEA (YELLOW BANDED)									16	
32 ASYCHIS ELONGATA									16	
33 ARICIDEA SP									16	
TOTAL NUMBER OF INDIVIDUALS	336	288			832	304			224	128

TABLE E149
EXPERIMENTAL STUDY BENTHIC DATA: POST-DISPOSAL PHASE SAMPLES.
NUMBER OF INDIVIDUALS/SQ.M. OF EACH SPECIES COLLECTED AT STATION 27-3 ON 25 MAY 76

SURF TEMP	SURF SAL	BOT TEMP	BOT SAL	DEPTH	SED TEMP	TIME ON	TIME OFF
26.0	28.0	24.5	33.0	14.0	24.5	800	835

SEDIMENTS: 2-3 CM OXIDIZED MUD OVER 10 CM SOFT MUD OVER GRAY CLAY

SPECIES	REPLICATES									
	1		2		3		4		5	
	ADLT	YNG	ADLT	YNG	ADLT	YNG	ADLT	YNG	ADLT	YNG
1 REPLICATES NOT ANALYZED			****	****			****	****		
2 MAGELONA SP	80				16				32	
3 SIGAMBRA WASSI	16				16				96	
4 LUMBRINERIS TENUIS		32				48			16	
5 CEREBRATULUS LACTEUS	16	32								32
6 DIOPATRA CUPREA	16				16				48	
7 BALANOGLOSSUS		48				16			16	
8 SIGAMBRA TENTACULATA	16	16				16				16
9 PRIONOSPIO PINNATA		16				16				32
10 GLYCINDE SOLITARIA		64								
11 ARMANDIA AGILIS		16			16				16	
12 PINNIXA CRISTATA					16	32				
13 AMPELISCA ABDITA		16				16				
14 NEREIS SP	16								16	
15 LEPIDASTHENIA SP						16			16	
16 COROPHIUM ACHERUSICUM					32					
17 ABRA AEQUALIS		16								
18 AGLAOPHAMUS VERRILLI		16								
19 CLYMENELLA ZONALIS									16	
20 COSSURA DELTA		16								
21 NINOE NIGRIPES		16								
22 PSEUDEURYTHOE AMBIGUA		16								
23 XANTHIDAE		16								
24 ANCISTROSYLLIS JONESI						16				
25 HEMIPHOLIS ELONGATA					16					
26 BASCANICHTHYS TERES					16					
27 STHENELAIS BOA									16	
28 MAGELONA ROSEA									16	
29 ASYCHIS ELONGATA									16	
TOTAL NUMBER OF INDIVIDUALS	160	336			144	176			320	80

TABLE E150
EXPERIMENTAL STUDY BENTHIC DATA: POST-DISPOSAL PHASE SAMPLES.
NUMBER OF INDIVIDUALS/SQ.M. OF EACH SPECIES COLLECTED AT STATION 27-4 ON 25 MAY 76

SURF TEMP	SURF SAL	BOT TEMP	BOT SAL	DEPTH	SED TEMP	TIME ON	TIME OFF
26.0	29.0	24.5	34.0	14.0	24.5	930	1015

SEDIMENTS: 1-2 CM OXIDIZED MUD OVER SANDY GRAY CLAY

SPECIES	REPLICATES 1		2		3		4		5	
	ADLT	YNG	ADLT	YNG	ADLT	YNG	ADLT	YNG	ADLT	YNG
1 REPLICATES NOT ANALYZED			****	****			****	****		
2 CEREBRATULUS LACTEUS					16	64				16
3 MAGELONA SP	16				32				48	
4 ASYCHIS ELONGATA	32				16				32	
5 LUMBRINERIS TENUIS		48								16
6 SIGAMBRA WASSI	48									
7 ANCISTROSYLLIS JONESI						48				
8 NEREIS SP	16								16	
9 DIOPATRA CUPREA					16				16	
10 SIGAMBRA TENTACULATA						16			16	
11 NINOE NIGRIPES	16									
12 GYPTIS VITTATA		16								
13 CLYMENELLA ZONALIS					16					
14 CALLIANASSA LATISPINA					16					
15 GLYCERA AMERICANA									16	
16 GLYCINDE SOLITARIA										16
17 HEMIPHOLIS ELONGATA										16
18 SCOLEPSIS SQUAMATA										16
19 THARYX SETIGERA		16								
20 PHOTIS SP.	16									
TOTAL NUMBER OF INDIVIDUALS	144	80			112	128			144	80

TABLE E151
EXPERIMENTAL STUDY BENTHIC DATA: POST-DISPOSAL PHASE SAMPLES.
NUMBER OF INDIVIDUALS/SQ.M. OF EACH SPECIES COLLECTED AT STATION 27-5 ON 25 MAY 76

SURF TEMP	SURF SAL	BOT TEMP	BOT SAL	DEPTH	SED TEMP	TIME ON	TIME OFF
26.0	29.0	24.5	34.0	14.0	25.0	840	920

SEDIMENTS: 2 CM OXIDIZED MUD OVER GRAY CLAY

SPECIES	REPLICATES									
	1		2		3		4		5	
	ADLT	YNG	ADLT	YNG	ADLT	YNG	ADLT	YNG	ADLT	YNG
1 REPLICATES NOT ANALYZED			****	****			****	****		
2 MAGELONA SP	112				144				48	
3 LUMBRINERIS TENUIS	16	112				128			16	
4 SIGAMBRA TENTACULATA	16	32			16	96				
5 GLYCINDE SOLITARIA		112				48				
6 PRIONOSPIO PINNATA	32	32			48					
7 SIGAMBRA WASSI	80	16							16	
8 ANCISTROSYLLIS JONESI		80								
9 NINOE NIGRIPES	16				32					
10 PRIONOSPIO CIRRIFERA		48								
11 AMPELISCA ABDITA					32				16	
12 COSSURA DELTA	16					16				
13 GLYCERA AMERICANA					16				16	
14 BALANOGLOSSUS					16	16				
15 CEREBRATULUS LACTEUS		16								
16 CLYMENELLA ZONALIS		16								
17 NEREIS SP	16									
18 GYPTIS VITTATA		16								
19 COROPHIUM ACHERUSICUM	16									
20 CIRRATULUS HEDGPETHI					16					
21 MAGELONA ROSEA					16					
22 ASYCHIS ELONGATA						16				
23 DIOPATRA CUPREA									16	
24 POECILOCHAETUS JOHNSONI	16									
TOTAL NUMBER OF INDIVIDUALS	336	480			336	320			128	

Table E152. Means and standard deviations of the benthic populations collected in the DMDS

Stations		July	Sept	Nov	Jan	Mar	May
2-1	$\bar{x}$	960	405	1264	522	250	1051
	s	622	40	515	360	91	504
2-2	$\bar{x}$	560	346	2092	2128	1568	1067
	s	142	295	426	1855	403	81
2-3	$\bar{x}$	1077	640	1296	2352	864	925
	s	352	277	960	2040	292	552
2-4	$\bar{x}$	1141	853	1419	1849	779	1035
	s	380	433	1160	481	275	107
2-5	$\bar{x}$	997	554	1109	699	427	1285
	s	734	224	313	260	61	480
15-1	$\bar{x}$	1605	731	1445	858	997	821
	s	660	176	149	33	285	176
15-2	$\bar{x}$	1072	837	1787	1024	1056	885
	s	459	333	454	560	427	595
15-3	$\bar{x}$	885	613	2213	1227	1275	1173
	s	162	361	537	459	904	149
15-4	$\bar{x}$	1941	1008	1797	1452	427	1573
	s	539	344	1182	697	228	1135
15-5	$\bar{x}$	2320	864	1392	725	1008	1115
	s	554	584	915	567	139	300
12-1	$\bar{x}$	1691	224	448	693	512	1019
	s	1440	305	346	305	300	517
12-2	$\bar{x}$	896	1125	618	1515	751	1269
	s	652	272	357	129	208	255
12-3	$\bar{x}$	939	299	416	1283	4021	1623
	s	672	128	291	754	871	823
12-4	$\bar{x}$	1072	469	976	738	485	2528
	s	48	337	111	310	285	792
12-5	$\bar{x}$	667	1146	619	320	1669	1333
	s	490	1543	337	258	1054	549

(continued)

Table E152 (concluded)

Stations		July	Sept	Nov	Jan	Mar	May
14-1	$\bar{x}$	3936	1077	768	3101	362	1115
	s	1878	596	320	386	250	300
14-2	$\bar{x}$	821	516	811	445	304	1328
	s	325	526	290	169	32	89
14-3	$\bar{x}$	2117	117	1104	1072	581	1669
	s	291	36	542	160	248	312
14-4	$\bar{x}$	1131	123	597	320	587	880
	s	615	116	674	48	109	312
14-5	$\bar{x}$	784	485	448	363	1595	1045
	s	210	688	347	116	377	399
27-1	$\bar{x}$	1157	75	1029	632	453	224
	s	824	46	537	292	266	178
27-2	$\bar{x}$	1157	128	432	341	373	703
	s	145	97	182	154	149	398
27-3	$\bar{x}$	1035	293	725	384	347	405
	s	232	176	566	204	296	88
27-4	$\bar{x}$	923	128	768	208	800	229
	s	133	167	304	16	100	9
27-5	$\bar{x}$	1029	565	859	304	352	533
	s	282	352	538	204	89	360

APPENDIX F

RAW MEIOBENTHIC DATA FROM THE EXPERIMENTAL STUDY

F

Table F1. Taxonomic list of all meiofaunal species collected during the experimental study in the offshore disposal site Galveston, Texas.

PROTOZOA
- Foraminifera
  - *Ammobaculites* cf *dilitatus*
  - *Ammonia beccari*
  - *Bigeneria irregularis*
  - *Elphidium poeyanum*
  - *Elphidium* sp.
  - Foraminifera sp.
  - *Globigerina*
  - *Nonion* cf *Pauciloculum*
  - *Proteonina comprima*
  - Miliolidae
  - *Reusella spinulosa*

CNIDARIA
- Hydrozoa
  - Hydroida sp.
- Actinaria
  - Anemone sp.
  - Cnidaria sp.

PLATYHELMINTHES
- Turbellaria
  - Turbellaria sp.

NEMATODA
- *Desmoscolex* sp.
- Nematoda sp.

KINORHYNCHA
- *Echinoderella remanei*
- *Pycnophyes* sp.
- *Trachydemus langi*

MOLLUSCA
- Gastropoda
  - Gastropoda sp.
  - *Nassarius acutus*
  - *Naticia pusilla*
  - *Vitrinella* sp.
- Bivalvia
  - *Abra aequalis*
  - Bivalvia spp.
  - *Nucula proxima*
  - *Nuculana* sp.
  - Veneridae

ANNELIDA
- Polychaeta
  - *Ancistrosyllis* sp.
  - Annelida spp.
  - Spionidae sp.

ARTHROPODA
- Crustacea
  - Ostracoda
    - Ostracoda sp. A
    - Ostracoda sp. B
    - Ostracoda sp. C
    - Ostracoda sp.
  - Cirripedia
    - Cypris larva
  - Copepoda
    - Harpacticoida
      - Canuella sp.
      - Harpacticoida sp. A
      - Harpacticoida sp. B
      - Harpacticoida spp.
- Arachnida
  - Acarina
    - Halicaridae sp.
- Pycnogonida
  - Pycnogonida sp.

HEMICHORDATA
- *Balanoglossus* sp.

INCERTAE SEDIS
- unknown

TABLE F2
EXPERIMENTAL STUDY MEIOFAUNAL DATA: PRE-DISPOSAL PHASE SAMPLES.
RAW NUMBER OF INDIVIDUALS OF EACH SPECIES COLLECTED AT STATION 2-1 ON 14 JUL 75

SURF TEMP	SURF SAL	BOT TEMP	BOT SAL	DEPTH	SED TEMP	TIME ON	TIME OFF
30.0				9.0	28.5	1410	1450

SEDIMENTS:

SPECIES	REPLICATES 1	2	3	4	5
1 *** NO DATA ***	****	****	****	****	****
TOTAL NUMBER OF INDIVIDUALS					

TABLE F3
EXPERIMENTAL STUDY MEIOFAUNAL DATA: PRE-DISPOSAL PHASE SAMPLES.
RAW NUMBER OF INDIVIDUALS OF EACH SPECIES COLLECTED AT STATION 2-2 ON 25 JUL 75

SURF TEMP	SURF SAL	BOT TEMP	BOT SAL	DEPTH	SED TEMP	TIME ON	TIME OFF
28.5				10.0	26.0	1055	1125

SEDIMENTS:

SPECIES	REPLICATES 1	2	3	4	5
1 *** NO DATA ***	****	****	****		****
2 ELPHIDIUM POEYANUM				80	
3 AMMONIA BECCARI				40	
4 OSTRACODA B				14	
5 GASTROPODA SP.				8	
6 MILIOLIDAE				8	
7 AMMOBACULITES CF DILITATUS				6	
8 OSTRACODA A				6	
9 NEMATODA SP.				4	
10 PROTEONINA COMPRIMA				4	
TOTAL NUMBER OF INDIVIDUALS				170	

TABLE F4
EXPERIMENTAL STUDY MEIOFAUNAL DATA: PRE-DISPOSAL PHASE SAMPLES.
RAW NUMBER OF INDIVIDUALS OF EACH SPECIES COLLECTED AT STATION 2-3 ON 14 JUL 75

SURF TEMP	SURF SAL	BOT TEMP	BOT SAL	DEPTH	SED TEMP	TIME ON	TIME OFF
30.0				11.0	26.0	1150	1245

SEDIMENTS:

SPECIES	REPLICATES 1	2	3	4	5
1 *** NO DATA ***		****	****		
2 AMMOBACULITES CF DILITATUS					79
3 NEMATODA SP.	2			32	3
4 AMMONIA BECCARI	22			4	2
5 ELPHIDIUM SP.	26				
6 MILIOLIDAE	8			10	5
7 ELPHIDIUM POEYANUM				8	6
8 NONION CF PAUCILOCULUM	12				1
9 PROTEONINA COMPRIMA				1	9
10 OSTRACODA A					7
11 TRACHYDEMUS LANGI				6	
12 GASTROPODA SP.	2				
13 CANUELLA SP.				2	
14 HARPACTICOIDA B				2	
15 ECHINODERELLA REMANEI				2	
16 PYCNOPHYES SP.				2	
17 BIGENERIA IRREGULARIS				1	
TOTAL NUMBER OF INDIVIDUALS	72			70	112

TABLE F5
EXPERIMENTAL STUDY MEIOFAUNAL DATA: PRE-DISPOSAL PHASE SAMPLES.
RAW NUMBER OF INDIVIDUALS OF EACH SPECIES COLLECTED AT STATION 2-4 ON 14 JUL 75

SURF TEMP	SURF SAL	BOT TEMP	BOT SAL	DEPTH	SED TEMP	TIME ON	TIME OFF
30.0				9.0	26.0	1300	1335

SEDIMENTS:

SPECIES	REPLICATES 1	2	3	4	5
1 ELPHIDIUM SP.	96		1504		
2 NONION CF PAUCILOCULUM	16		928	32	3
3 MILIOLIDAE	24	8	192	152	24
4 AMMONIA BECCARI	32	8	160	104	16
5 NEMATODA SP.	48	8	224	8	16
6 PROTEONINA COMPRIMA		24	32	96	60
7 ELPHIDIUM POEYANUM		8		160	40
8 BIVALVIA SPP.	56	16			16
9 OSTRACODA A	16			50	8
10 GASTROPODA SP.			64		
11 OSTRACODA B	16			14	8
12 NUCULANA SP.	16				16
13 BIGENERIA IRREGULARIS				16	9
14 NATICA PUSILLA	8				
15 AMMOBACULITES CF DILITATUS				8	
TOTAL NUMBER OF INDIVIDUALS	328	72	3104	640	216

TABLE F6
EXPERIMENTAL STUDY MEIOFAUNAL DATA: PRE-DISPOSAL PHASE SAMPLES.
RAW NUMBER OF INDIVIDUALS OF EACH SPECIES COLLECTED AT STATION 2-5 ON 14 JUL 75

SURF TEMP	SURF SAL	BOT TEMP	BOT SAL	DEPTH	SED TEMP	TIME ON	TIME OFF
30.0				10.0	26.0	1345	1420

SEDIMENTS:

SPECIES	REPLICATES 1	2	3	4	5
1 *** NO DATA ***		****		****	
2 ELPHIDIUM SP.	480				
3 NONION CF PAUCILOCULUM	176		36		
4 ELPHIDIUM POEYANUM			96		60
5 NEMATODA SP.	128		8		8
6 MILIOLIDAE			44		88
7 PROTEONINA COMPRIMA			90		40
8 AMMONIA BECCARII			4		56
9 NATICA PUSILLA	32				
10 BIVALVIA SPP.	16				
11 GASTROPODA SP.	16				
12 OSTRACODA A			9		4
13 AMMOBACULITES CF DILITATUS			12		
14 OSTRACODA B			3		
TOTAL NUMBER OF INDIVIDUALS	848		302		296

TABLE F7
EXPERIMENTAL STUDY MEIOFAUNAL DATA: PRE-DISPOSAL PHASE SAMPLES.
RAW NUMBER OF INDIVIDUALS OF EACH SPECIES COLLECTED AT STATION 15-1 ON 24 JUL 75

SURF TEMP	SURF SAL	BOT TEMP	BOT SAL	DEPTH	SED TEMP	TIME ON	TIME OFF
30.0	32.0	28.5			27.5	1640	1710

SEDIMENTS:

SPECIES	REPLICATES 1	2	3	4	5
1 *** NO DATA ***	****	****	****	****	
2 MILICLIDAE					12
3 AMMONIA BECCARI					4
4 NEMATODA SP.					3
5 CIRRIPEDE CYPRIS					1
6 ELPHICIUM SP.					1
TOTAL NUMBER OF INDIVIDUALS					21

TABLE F8

EXPERIMENTAL STUDY MEIOFAUNAL DATA: PRE-DISPOSAL PHASE SAMPLES.

RAW NUMBER OF INDIVIDUALS OF EACH SPECIES COLLECTED AT STATION 15-2 ON 25 JUL 75

SURF TEMP	SURF SAL	BOT TEMP	BOT SAL	DEPTH	SED TEMP	TIME ON	TIME OFF
						9999	9999

SEDIMENTS:

SPECIES	REPLICATES 1	2	3	4	5
1 *** NO DATA ***	****	****	****	****	****
TOTAL NUMBER OF INDIVIDUALS					

TABLE F9
EXPERIMENTAL STUDY MEIOFAUNAL DATA: PRE-DISPOSAL PHASE SAMPLES.
RAW NUMBER OF INDIVIDUALS OF EACH SPECIES COLLECTED AT STATION 15-3 ON 25 JUL 75

SURF TEMP	SURF SAL	BOT TEMP	BOT SAL	DEPTH	SED TEMP	TIME ON	TIME OFF
						9999	9999

SEDIMENTS:

SPECIES	REPLICATES 1	2	3	4	5
1 *** NO DATA ***	****	****	****	****	****
TOTAL NUMBER OF INDIVIDUALS					

TABLE F10
EXPERIMENTAL STUDY MEIOFAUNAL DATA: PRE-DISPOSAL PHASE SAMPLES.
RAW NUMBER OF INDIVIDUALS OF EACH SPECIES COLLECTED AT STATION 15-4 ON 25 JUL 75

SURF TEMP	SURF SAL	BOT TEMP	BOT SAL	DEPTH	SED TEMP	TIME ON	TIME OFF
						9999	9999

SEDIMENTS:

SPECIES	REPLICATES 1	2	3	4	5
1 *** NO DATA ***	****	****	****	****	****
TOTAL NUMBER OF INDIVIDUALS					

TABLE F11
EXPERIMENTAL STUDY MEIOFAUNAL DATA: PRE-DISPOSAL PHASE SAMPLES.
RAW NUMBER OF INDIVIDUALS OF EACH SPECIES COLLECTED AT STATION 15-5 ON 23 JUL 75

SURF TEMP	SURF SAL	BOT TEMP	BOT SAL	DEPTH	SED TEMP	TIME ON	TIME OFF
30.0	31.0	29.0		10.0	28.0	1600	1645

SEDIMENTS:

SPECIES	REPLICATES 1	2	3	4	5
1 *** NO DATA ***				****	
2 MILICLIDAE	1	14			64
3 NEMATODA SP.	2	5	8		32
4 BIVALVIA SPP.			24		
5 VITRINELLA SP.					16
6 BIGENERIA IRREGULARIS					16
7 ELPHIDIUM SP.		6			
8 AMMONIA BECCARI		6			
9 OSTRACODA A	1	1	4		
10 PROTECNINA COMPRIMA	1	3			
11 ANNELIDA SPP.			4		
12 CIRRIPEDE CYPRIS			4		
13 GASTROPODA SP.			4		
14 NONION CF PAUCILOCULUM		2			
15 AMMOBACULITES CF DILITATUS	1				
TOTAL NUMBER OF INDIVIDUALS	6	38	48		128

TABLE F12
EXPERIMENTAL STUDY MEIOFAUNAL DATA: PRE-DISPOSAL PHASE SAMPLES.
RAW NUMBER OF INDIVIDUALS OF EACH SPECIES COLLECTED AT STATION 14-1 ON 22 JUL 75

SURF TEMP	SURF SAL	BOT TEMP	BOT SAL	DEPTH	SED TEMP	TIME ON	TIME OFF
28.5	31.0	28.5		14.0	28.0	0815	0930

SEDIMENTS:

SPECIES	REPLICATES				
	1	2	3	4	5
1 ELPHIDIUM SP.	8		40		520
2 NONION CF PAUCILOCULUM	8		8		256
3 AMMONIA BECCARI		12	24	40	144
4 PROTEONINA COMPRIMA	16	12	176	8	
5 MILIOLIDAE		16	16	8	168
6 NEMATODA SP.	56	8	16	64	16
7 BIVALVIA SPP.	8		8	8	40
8 GASTROPODA SP.	8				16
9 BIGENERIA IRREGULARIS		4		16	
10 OSTRACODA SP.					16
11 ABRA AEQUALIS					16
12 NUCULANA SP.		12			
13 PYCNOPHYES SP.	8				
TOTAL NUMBER OF INDIVIDUALS	112	64	288	144	1192

TABLE F13
EXPERIMENTAL STUDY MEIOFAUNAL DATA: PRE-DISPOSAL PHASE SAMPLES.
RAW NUMBER OF INDIVIDUALS OF EACH SPECIES COLLECTED AT STATION 14-2 ON 22 JUL 75

SURF TEMP	SURF SAL	BOT TEMP	BOT SAL	DEPTH	SED TEMP	TIME ON	TIME OFF
28.5	31.0	28.5		14.0	28.0	1245	1325

SEDIMENTS:

SPECIES	REPLICATES 1	2	3	4	5
1 *** NO DATA ***				****	
2 ELPHIDIUM SP.	120	34	10		6
3 NEMATODA SP.	32	6	14		114
4 PROTEONINA COMPRIMA			22		68
5 AMMONIA BECCARI	72		2		10
6 NONION CF PAUCILOCULUM		26	14		10
7 MILIOLIDAE	16	2	4		2
8 BIGENERIA IRREGULARIS					12
9 BIVALVIA SPP.	8				
10 OSTRACODA SP.			4		4
11 GASTROPODA SP.	8				
12 AMMOBACULITES CF DILITATUS			4		4
13 CANLELLA SP.					2
14 HARPACTICOIDA SPP.					2
15 TRACHYDEMUS LANGI					2
TOTAL NUMBER OF INDIVIDUALS	256	68	74		236

F1A

TABLE F14
EXPERIMENTAL STUDY MEIOFAUNAL DATA: PRE-DISPOSAL PHASE SAMPLES.
RAW NUMBER OF INDIVIDUALS OF EACH SPECIES COLLECTED AT STATION 14-3 ON 22 JUL 75

SURF TEMP	SURF SAL	BOT TEMP	BOT SAL	DEPTH	SED TEMP	TIME ON	TIME OFF
29.0	31.0	28.5		14.0	28.0	1145	1235

SEDIMENTS:

SPECIES	REPLICATES 1	2	3	4	5
1 ELPHIDIUM SP.	6	360		6	
2 AMMONIA BECCARI	40	80	1	10	8
3 NONION CF PAUCILOCULUM		80		16	2
4 PROTEONINA COMPRIMA	20			62	
5 NEMATODA SP.	8	8	3	10	6
6 MILIOLIDAE	4	24	1	6	
7 AMMOBACULITES CF DILITATUS	4			10	
8 BIVALVIA SPP.	2	8	1	2	
9 FORAM SP.		8			
10 OSTRACODA SP.				4	2
11 BIGENERIA IRREGULARIS	4				
12 TRACHYDEMUS LANGI	2		2		
13 PYCNOPHYES SP.			1		
TOTAL NUMBER OF INDIVIDUALS	90	568	9	126	18

TABLE F15
EXPERIMENTAL STUDY MEIOFAUNAL DATA: PRE-DISPOSAL PHASE SAMPLES.
RAW NUMBER OF INDIVIDUALS OF EACH SPECIES COLLECTED AT STATION 14-4 ON 22 JUL 75

SURF TEMP	SURF SAL	BOT TEMP	BOT SAL	DEPTH	SED TEMP	TIME ON	TIME OFF
30.0	31.0	28.5		14.0	28.0	1335	1420

SEDIMENTS:

SPECIES	REPLICATES 1	2	3	4	5
1 *** NO DATA ***		****		****	
2 PROTEONINA COMPRIMA			76		68
3 ELPHIDIUM SP.	56		56		20
4 NEMATODA SP.	2		28		44
5 AMMONIA BECCARI	18		32		24
6 AMMOBACULITES CF DILITATUS			28		24
7 NONION CF PAUCILOCULUM	14		16		
8 BIVALVIA SPP.			20		4
9 MILIOLIDAE	2		12		8
10 BIGENERIA IRREGULARIS			20		
11 ECHINODERELLA REMANEI					12
12 OSTRACODA SP.	2		8		
13 GASTROPODA SP.	4		4		
14 ANNELIDA SPP.			8		
15 CANUELLA SP.					8
16 OSTRACODA A					8
17 PYCNOPHYES SP.					4
18 CIRRIPEDE CYPRIS			4		
TOTAL NUMBER OF INDIVIDUALS	98		312		224

TABLE F16
EXPERIMENTAL STUDY MEIOFAUNAL DATA: PRE-DISPOSAL PHASE SAMPLES.
RAW NUMBER OF INDIVIDUALS OF EACH SPECIES COLLECTED AT STATION 14-5 ON 22 JUL 75

SURF TEMP	SURF SAL	BOT TEMP	BOT SAL	DEPTH	SED TEMP	TIME ON	TIME OFF
29.0		28.5		14.5	28.C	0945	1100

SEDIMENTS:

SPECIES	REPLICATES 1	2	3	4	5
1 *** NO DATA ***		****			****
2 ELPHIDIUM SP.	3		6	160	
3 AMMONIA BECCARI	2		4	80	
4 NEMATODA SP.	5		62	8	
5 NONION CF PAUCILOCULUM	1		6	24	
6 PROTEONINA COMPRIMA	7		14		
7 AMMOBACULITES CF DILITATUS			6		
8 BIVALVIA SPP.	1		2		
TOTAL NUMBER OF INDIVIDUALS	19		100	272	

TABLE F17
EXPERIMENTAL STUDY MEIOFAUNAL DATA: PRE-DISPOSAL PHASE SAMPLES.
RAW NUMBER OF INDIVIDUALS OF EACH SPECIES COLLECTED AT STATION 12-1 ON 21 JUL 75

SURF TEMP	SURF SAL	BOT TEMP	BOT SAL	DEPTH	SED TEMP	TIME ON	TIME OFF
29.0				13.0	28.0	1415	1515

SEDIMENTS:

SPECIES	REPLICATES 1	2	3	4	5
1 *** NO DATA ***		****	****	****	
2 ELPHIDIUM SP.	76				
3 AMMONIA BECCARI	66				2
4 NEMATODA SP.	18				6
5 MILIOLIDAE	18				3
6 NONION CF PAUCILOCULUM	6				
7 PROTEONINA COMPRIMA	2				
8 BIGENERIA IRREGULARIS					2
9 ACARINA SP.					2
10 ANNELIDA SPP.					2
11 OSTRACODA A					1
12 OSTRACODA B					1
TOTAL NUMBER OF INDIVIDUALS	186				19

TABLE F18
EXPERIMENTAL STUDY MEIOFAUNAL DATA: PRE-DISPOSAL PHASE SAMPLES.
RAW NUMBER OF INDIVIDUALS OF EACH SPECIES COLLECTED AT STATION 12-2 ON 21 JUL 75

SURF TEMP	SURF SAL	BOT TEMP	BOT SAL	DEPTH	SED TEMP	TIME ON	TIME OFF
						9999	9999

SEDIMENTS:

SPECIES	REPLICATES 1	2	3	4	5
1 *** NO DATA ***		****			
2 NEMATODA SP.	3		1	14	104
3 AMMONIA BECCARI	7		6	8	56
4 ELPHIDIUM SP.	10			3	72
5 MILIOLIDAE	1		9	16	28
6 BIVALVIA SPP.					44
7 ANNELIDA SPP.					32
8 OSTRACODA SP.			1	1	28
9 AMMOBACULITES CF DILITATUS			18	11	
10 NONION CF PAUCILOCULUM	11		1	1	16
11 TRACHYDEMUS LANGI			1	6	16
12 PROTECNINA COMPRIMA	3		11	4	
13 HARPACTICOIDA SPP.				2	4
14 NATICA PUSILLA					4
15 ECHINODERELLA REMANEI					4
16 BIGENERIA IRREGULARIS				1	
17 GASTROPODA SP.	1				
18 ANCISTROSYLLIS SP.				1	
TOTAL NUMBER OF INDIVIDUALS	36		48	68	448

TABLE F19
EXPERIMENTAL STUDY MEIOFAUNAL DATA: PRE-DISPOSAL PHASE SAMPLES.
RAW NUMBER OF INDIVIDUALS OF EACH SPECIES COLLECTED AT STATION 12-3 ON 21 JUL 75

SURF TEMP	SURF SAL	BOT TEMP	BOT SAL	DEPTH	SED TEMP	TIME ON	TIME OFF
				12.5		1520	1610

SEDIMENTS:

SPECIES	REPLICATES 1	2	3	4	5
1 *** NO DATA ***				****	****
2 ELPHIDIUM SP.	2		4096		
3 NONION CF PAUCILOCULUM	2		1216		
4 AMMONIA BECCARI		12	443		
5 MILIOLIDAE	40	6	64		
6 NEMATODA SP.	4	6			
7 PROTECNINA COMPRIMA	2	4			
8 TRACHYDEMUS LANGI		4			
9 OSTRACODA SP.	2	2			
10 BIVALVIA SPP.		2			
11 CIRRIPEDE CYPRIS		1			
12 ANEMONE		1			
TOTAL NUMBER OF INDIVIDUALS	52	38	5824		

TABLE F20
EXPERIMENTAL STUDY MEIOFAUNAL DATA: PRE-DISPOSAL PHASE SAMPLES.
RAW NUMBER OF INDIVIDUALS OF EACH SPECIES COLLECTED AT STATION 12-4 ON 21 JUL 75

SURF TEMP	SURF SAL	BOT TEMP	BOT SAL	DEPTH	SED TEMP	TIME ON	TIME OFF
				12.5		1750	1830

SEDIMENTS:

SPECIES	REPLICATES				
	1	2	3	4	5
1 *** NO DATA ***	****		****	****	****
2 MILIOLIDAE		48			
3 AMMONIA BECCARI		16			
4 ELPHIDIUM SP.		10			
5 OSTRACODA B		10			
6 PROTEONINA COMPRIMA		10			
7 OSTRACODA A		10			
8 AMMOBACULITES CF DILITATUS		4			
9 NEMATODA SP.		2			
10 NONION CF PAUCILOCULUM		2			
TOTAL NUMBER OF INDIVIDUALS		112			

TABLE F21
EXPERIMENTAL STUDY MEIOFAUNAL DATA: PRE-DISPOSAL PHASE SAMPLES.
RAW NUMBER OF INDIVIDUALS OF EACH SPECIES COLLECTED AT STATION 12-5 ON 21 JUL 75

SURF TEMP	SURF SAL	BOT TEMP	BOT SAL	DEPTH	SED TEMP	TIME ON	TIME OFF
29.0		28.0		12.5	28.0	1220	1340

SEDIMENTS:

SPECIES	REPLICATES				
	1	2	3	4	5
1 *** NO DATA ***		****	****	****	
2 MILIOLIDAE	264				12
3 AMMONIA BECCARI	80				4
4 ELPHIDIUM SP.	72				10
5 AMMOBACULITES CF DILITATUS					54
6 UNKNOWN	48				
7 OSTRACODA SP.	24				2
8 NEMATODA SP.	16				8
9 NONION CF PAUCILOCULUM	8				2
10 PROTEONINA COMPRIMA					4
11 BIGENERIA IRREGULARIS					2
TOTAL NUMBER OF INDIVIDUALS	512				98

TABLE F22
EXPERIMENTAL STUDY MEIOFAUNAL DATA: PRE-DISPOSAL PHASE SAMPLES.
RAW NUMBER OF INDIVIDUALS OF EACH SPECIES COLLECTED AT STATION 27-1 ON 23 JUL 75

SURF TEMP	SURF SAL	BOT TEMP	BOT SAL	DEPTH	SED TEMP	TIME ON	TIME OFF
29.0		29.0			28.5	1055	1130

SEDIMENTS:

SPECIES	REPLICATES 1	2	3	4	5
1 *** NO DATA ***				****	
2 AMMOBACULITES CF DILITATUS		23			2
3 OSTRACODA A	3	4	2		3
4 AMMONIA BECCARI		3			8
5 MILIOLIDAE		10			1
6 PROTEONINA COMPRIMA	1				10
7 NEMATODA SP.	3	1			5
8 TRACHYDEMUS LANGI					5
9 OSTRACODA B		3			
10 NONION CF PAUCILOCULUM		2			
11 BIVALVIA SPP.			1		1
12 BIGENERIA IRREGULARIS	1				
13 HARPACTICOIDA SPP.			1		
TOTAL NUMBER OF INDIVIDUALS	8	46	4		35

TABLE F23
EXPERIMENTAL STUDY MEICFAUNAL DATA: PRE-DISPOSAL PHASE SAMPLES.
RAW NUMBER OF INDIVIDUALS OF EACH SPECIES COLLECTED AT STATION 27-2 ON 23 JUL 75

SURF TEMP	SURF SAL	BOT TEMP	BOT SAL	DEPTH	SED TEMP	TIME ON	TIME OFF
30.0		27.5			28.0	1305	1415

SEDIMENTS:

SPECIES	REPLICATES 1	2	3	4	5
1 *** NO DATA ***			****		
2 AMMOBACULITES CF DILITATUS		44			
3 FORAM SP.					21
4 MILIOLIDAE	2	17			
5 NEMATODA SP.	6	4			3
6 PROTECNINA COMPRIMA	6	1			
7 AMMONIA BECCARI	1	4			
8 OSTRACODA A				2	2
9 ELPHIDIUM SP.		3			
10 NONION CF PAUCILOCULUM		1			
TOTAL NUMBER OF INDIVIDUALS	15	74		2	26

TABLE F24

EXPERIMENTAL STUDY METOFAUNAL DATA: PRE-DISPOSAL PHASE SAMPLES.

RAW NUMBER OF INDIVIDUALS OF EACH SPECIES COLLECTED AT STATION 27-3 ON 23 JUL 75

SURF TEMP	SURF SAL	BOT TEMP	BOT SAL	DEPTH	SED TEMP	TIME ON	TIME OFF
29.0		29.0			27.0	0915	1030

SEDIMENTS:

SPECIES	REPLICATES 1	2	3	4	5
1 *** NO DATA ***	****			****	
2 NEMATODA SP.		164	1		
3 HARPACTICOIDA A		12			
4 ECHINODERELLA REMANEI		10			
5 AMMONIA BECCARI		8			
6 MILIOLIDAE		6	2		
7 OSTRACODA A		2	2		
8 NATICA PUSILLA		2			2
9 ANNELIDA SPP.		4			
10 CNIDARIA SP.		4			
11 ELPHIDIUM SP.			4		
12 BIVALVIA SPP.			2		2
13 GASTROPODA SP.					4
14 DESMOSCOLEX SP.		2			
15 PROTEONINA COMPRIMA			1		
TOTAL NUMBER OF INDIVIDUALS		214	12		8

TABLE F25
EXPERIMENTAL STUDY MEIOFAUNAL DATA: PRE-DISPOSAL PHASE SAMPLES.
RAW NUMBER OF INDIVIDUALS OF EACH SPECIES COLLECTED AT STATION 27-4 ON 23 JUL 75

SURF TEMP	SURF SAL	BOT TEMP	BOT SAL	DEPTH	SED TEMP	TIME ON	TIME OFF
30.0		29.0			27.5	1435	1535

SEDIMENTS:

SPECIES	REPLICATES 1	2	3	4	5
1 *** NO DATA ***	****			****	
2 AMMOBACULITES CF DILITATUS		112			
3 NEMATODA SP.		58	8		1
4 ELPHIDIUM SP.		40	18		
5 PROTELPHIDIUM (?) COMPRIMA		42			
6 MILIOLIDAE		22	20		
7 AMMONIA BECCARI		36			
8 NONION CF PAUCILOCULUM		20	8		
9 FORAM SP.					14
10 OSTRACODA A		2	4		3
11 BIVALVIA SPP.		2	6		
12 GASTROPODA SP.			4		
13 HARPACTICOIDA A		2			1
14 PYCNOPHYES SP.		2			
15 BIGENERIA IRREGULARIS		2			
TOTAL NUMBER OF INDIVIDUALS		340	68		19

F-26

TABLE F26
EXPERIMENTAL STUDY MEIOFAUNAL DATA: PRE-DISPOSAL PHASE SAMPLES.
RAW NUMBER OF INDIVIDUALS OF EACH SPECIES COLLECTED AT STATION 27-5 ON 23 JUL 75

SURF TEMP	SURF SAL	BOT TEMP	BOT SAL	DEPTH	SED TEMP	TIME ON	TIME OFF
29.5		29.5			27.0	1200	1250

SEDIMENTS:

SPECIES	REPLICATES 1	2	3	4	5
1 *** NO DATA ***		****	****		****
2 MILIOLIDAE				34	
3 NEMATODA SP.	3			8	
4 AMMONIA BECCARI				10	
5 BIVALVIA SPP.				8	
6 ELPHIDIUM SP.				8	
7 TRACHYDEMUS LANGI	2			4	
8 GASTROPODA SP.				4	
9 FORAM SP.	2				
10 HARPACTICOIDA A				2	
11 PYCNOGONIDA SP.	2				
12 OSTRACODA A	1				
13 PYCNOPHYES SP.	1				
TOTAL NUMBER OF INDIVIDUALS	11			78	

TABLE F27
EXPERIMENTAL STUDY MEIOFAUNAL DATA: POST-DISPOSAL PHASE SAMPLES.
RAW NUMBER OF INDIVIDUALS OF EACH SPECIES COLLECTED AT STATION 2-1 ON 18 SEP 75

SURF TEMP	SURF SAL	BOT TEMP	BOT SAL	DEPTH	SED TEMP	TIME ON	TIME OFF
29.0	25.0	28.0	29.0	10.8	28.5	1330	1345

SEDIMENTS:

SPECIES	REPLICATES 1	2	3	4	5
1 *** NO DATA ***		****	****	****	****
2 ELPHIDIUM SP.	336				
3 AMMONIA BECCARI	280				
4 NEMATODA SP.	48				
5 GASTROPODA SP.	16				
6 MILIOLIDAE	16				
TOTAL NUMBER OF INDIVIDUALS	696				

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AQUATIC DISPOSAL FIELD INVESTIGATIONS GALVESTON, TEXAS, OFFSHOR--ETC(U)
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TABLE F28
EXPERIMENTAL STUDY MEIOFAUNAL DATA: POST-DISPOSAL PHASE SAMPLES.
RAW NUMBER OF INDIVIDUALS OF EACH SPECIES COLLECTED AT STATION 2-2 ON 18 SEP 75

SURF TEMP	SURF SAL	BOT TEMP	BOT SAL	DEPTH	SED TEMP	TIME ON	TIME OFF
						9999	9999

SEDIMENTS:

SPECIES	REPLICATES 1	2	3	4	5
1 *** NO DATA ***	****	****	****	****	****
TOTAL NUMBER OF INDIVIDUALS					

TABLE F29
EXPERIMENTAL STUDY MEIOFAUNAL DATA: POST-DISPOSAL PHASE SAMPLES.
RAW NUMBER OF INDIVIDUALS OF EACH SPECIES COLLECTED AT STATION 2-3 ON 18 SEP 75

SURF TEMP	SURF SAL	BOT TEMP	BOT SAL	DEPTH	SED TEMP	TIME ON	TIME OFF
28.0	24.0	28.0	32.0	11.0	28.0	1430	1500

SEDIMENTS:

SPECIES	REPLICATES 1	2	3	4	5
1 *** NO DATA ***	****		****	****	
2 NONION CF PAUCILOCULUM					70
3 ELPHIDIUM SP.		6			50
4 MILIOLIDAE		12			34
5 ANNELIDA SPP.		36			
6 NEMATODA SP.		6			14
7 AMMONIA BECCARI		12			8
8 BIVALVIA SPP.					4
TOTAL NUMBER OF INDIVIDUALS		72			180

TABLE F30
EXPERIMENTAL STUDY MEIOFAUNAL DATA: POST-DISPOSAL PHASE SAMPLES.
RAW NUMBER OF INDIVIDUALS OF EACH SPECIES COLLECTED AT STATION 2-4 ON 20 SEP 75

SURF TEMP	SURF SAL	BOT TEMP	BOT SAL	DEPTH	SED TEMP	TIME ON	TIME OFF
28.0	23.0	28.0	30.0	11.0	28.0	1002	1030

SEDIMENTS:

SPECIES	REPLICATES 1	2	3	4	5
1 *** NO DATA ***		****			
2 MILIOLIDAE	64		50	6	42
3 AMMONIA BECCARI	32		18	8	78
4 ELPHIDIUM SP.	32		44		6
5 NEMATODA SP.	16		8	2	48
6 ANNELIDA SPP.				10	12
7 GASTROPODA SP.			8	2	6
8 BIVALVIA SPP.			4	2	6
9 NONION CF PAUCILOCULUM			4		6
TOTAL NUMBER OF INDIVIDUALS	144		136	30	204

TABLE F31
EXPERIMENTAL STUDY MEIOFAUNAL DATA: POST-DISPOSAL PHASE SAMPLES.
RAW NUMBER OF INDIVIDUALS OF EACH SPECIES COLLECTED AT STATION 2-5 ON 20 SEP 75

SURF TEMP	SURF SAL	BOT TEMP	BOT SAL	DEPTH	SED TEMP	TIME ON	TIME OFF
28.0	25.0	28.0	30.0	11.0	28.5	1040	1130

SEDIMENTS:

SPECIES	REPLICATES 1	2	3	4	5
1 *** NO DATA ***		****	****	****	****
2 ELPHIDIUM SP.	1392				
3 AMMONIA BECCARI	1024				
4 NONION CF PAUCILOCULUM	288				
5 NEMATODA SP.	272				
6 MILIOLIDAE	64				
7 GASTROPODA SP.	48				
8 OSTRACODA A	16				
9 NATICA PUSILLA	16				
TOTAL NUMBER OF INDIVIDUALS	3120				

TABLE F32
EXPERIMENTAL STUDY MEIOFAUNAL DATA: POST-DISPOSAL PHASE SAMPLES.
RAW NUMBER OF INDIVIDUALS OF EACH SPECIES COLLECTED AT STATION 15-1 ON 18 SEP 75

SURF TEMP	SURF SAL	BOT TEMP	BOT SAL	DEPTH	SED TEMP	TIME ON	TIME OFF
						9999	9999

SEDIMENTS:

SPECIES	REPLICATES				
	1	2	3	4	5
1 *** NO DATA ***	****	****	****	****	****
TOTAL NUMBER OF INDIVIDUALS					

TABLE F33
EXPERIMENTAL STUDY MEIOFAUNAL DATA: POST-DISPOSAL PHASE SAMPLES.
RAW NUMBER OF INDIVIDUALS OF EACH SPECIES COLLECTED AT STATION 15-2 ON 18 SEP 75

SURF TEMP	SURF SAL	BOT TEMP	BOT SAL	DEPTH	SED TEMP	TIME ON	TIME OFF
28.0	24.0	28.0	29.0		28.0	0940	1020

SEDIMENTS:

SPECIES	REPLICATES 1	2	3	4	5
1 *** NO DATA ***	****	****		****	****
2 NEMATODA SP.			10		
3 MILIOLIDAE			5		
4 OSTRACODA A			3		
5 AMMONIA BECCARI			2		
6 ACARINA SP.			2		
7 GASTROPODA SP.			2		
8 ELPHIDIUM SP.			1		
9 ANNELIDA SPP.			1		
TOTAL NUMBER OF INDIVIDUALS			26		

TABLE F34
EXPERIMENTAL STUDY MEIOFAUNAL DATA: POST-DISPOSAL PHASE SAMPLES.
RAW NUMBER OF INDIVIDUALS OF EACH SPECIES COLLECTED AT STATION 15-3 ON 18 SEP 75

SURF TEMP	SURF SAL	BOT TEMP	BOT SAL	DEPTH	SED TEMP	TIME ON	TIME OFF
						9999	9999

SEDIMENTS:

SPECIES	REPLICATES 1	2	3	4	5
1 *** NO DATA ***	****	****	****	****	****
TOTAL NUMBER OF INDIVIDUALS					

TABLE F35
EXPERIMENTAL STUDY MEIOFAUNAL DATA: POST-DISPOSAL PHASE SAMPLES.
RAW NUMBER OF INDIVIDUALS OF EACH SPECIES COLLECTED AT STATION 15-4 ON 18 SEP 75

SURF TEMP	SURF SAL	BOT TEMP	BOT SAL	DEPTH	SED TEMP	TIME ON	TIME OFF
28.0	24.0	28.0	29.0		28.0	1035	1115

SEDIMENTS:

SPECIES	REPLICATES				
	1	2	3	4	5
1 MILIOLIDAE	15	16	8	5	13
2 AMMONIA BECCARI	10	22	5	16	3
3 NEMATODA SP.	6	7	18	9	2
4 ANNELIDA SPP.			27	1	5
5 ELPHIDIUM SP.		9	10	1	9
6 NONION CF PAUCILOCULUM		3	11	1	1
7 PROTEONINA COMPRIMA		7	3	5	
8 OSTRACODA B	4	2		6	
9 OSTRACODA A	1	6			1
10 BIGENERIA IRREGULARIS			6		
11 NEMATODA SP.			5		
12 GASTROPODA SP.		1	1		
13 BIVALVIA SPP.	1		1		
14 NUCULA PROXIMA	1				
15 PROTEONINA COMPRIMA	1				
16 TRACHYDEMUS LANGI	1				
17 BALANOGLOSSUS			1		
18 TRACHYDEMUS LANGI				1	
19 VITRINELLA SP.				1	
20 NASSARIUS ACUTUS				1	
21 NATICA PUSILLA				1	
22 NUCULANA SP.				1	
23 TURBELLARIA				1	
TOTAL NUMBER OF INDIVIDUALS	40	73	96	50	34

TABLE F36
EXPERIMENTAL STUDY MEIOFAUNAL DATA: POST-DISPOSAL PHASE SAMPLES.
RAW NUMBER OF INDIVIDUALS OF EACH SPECIES COLLECTED AT STATION 15-5 ON 18 SEP 75

SURF TEMP	SURF SAL	BOT TEMP	BOT SAL	DEPTH	SED TEMP	TIME ON	TIME OFF
28.5	24.0	28.0	29.0		28.0	1125	1200

SEDIMENTS:

SPECIES	REPLICATES 1	2	3	4	5
1 *** NO DATA ***		****		****	
2 FORAM SP.					72
3 MILIOLIDAE	2		32		
4 AMMONIA BECCARI	3		27		
5 ANNELIDA SPP.			14		6
6 NEMATODA SP.	2		7		8
7 OSTRACODA A	1		1		7
8 OSTRACODA B			1		7
9 ELPHIDIUM SP.	1		6		
10 BIVALVIA SPP.	2		1		
11 BIGENERIA IRREGULARIS			2		
12 NONION CF PAUCILOCULUM	2				
13 PROTEONINA COMPRIMA			1		
14 AMMOBACULITES CF DILITATUS	1				
15 REUSELLA SPINULOSA			1		
16 GASTROPODA SP.			1		
TOTAL NUMBER OF INDIVIDUALS	14		94		100

TABLE F37
EXPERIMENTAL STUDY MEIOFAUNAL DATA: POST-DISPOSAL PHASE SAMPLES.
RAW NUMBER OF INDIVIDUALS OF EACH SPECIES COLLECTED AT STATION 14-1 ON 15 SEP 75

SURF TEMP	SURF SAL	BOT TEMP	BOT SAL	DEPTH	SED TEMP	TIME ON	TIME OFF
28.0	22.0	28.0	28.0		28.0	0830	1000

SEDIMENTS:

SPECIES	REPLICATES				
	1	2	3	4	5
1 AMMONIA BECCARI	16	24	3		4
2 PROTEONINA COMPRIMA			28	1	8
3 NEMATODA SP.	5	8	9	2	12
4 MILIOLIDAE	5	20		2	4
5 ELPHIDIUM SP.		24	3		
6 BIGENERIA IRREGULARIS				8	
7 ACARINA SP.	2				2
8 ANNELIDA SPP.	2		1		
9 GLOBIGERINA			1		2
10 VENERIDAE					2
11 ECHINODERELLA REMANEI	1				
12 HARPACTICOIDA A	1				
13 HARPACTICOIDA B	1				
14 AMMOBACULITES CF DILITATUS			1		
TOTAL NUMBER OF INDIVIDUALS	33	76	46	13	34

TABLE F38
EXPERIMENTAL STUDY MEIOFAUNAL DATA: POST-DISPOSAL PHASE SAMPLES.
RAW NUMBER OF INDIVIDUALS OF EACH SPECIES COLLECTED AT STATION 14-2 ON 15 SEP 75

SURF TEMP	SURF SAL	BOT TEMP	BOT SAL	DEPTH	SED TEMP	TIME ON	TIME OFF
28.0	28.0	28.0	28.0		28.0	1510	1300

SEDIMENTS:

SPECIES	REPLICATES 1	2	3	4	5
1 *** NO DATA ***		****	****		****
2 MILIOLIDAE	30			4	
3 NEMATODA SP.	24			1	
4 AMMONIA BECCARI	2				
5 NONION CF PAUCILOCULUM				1	
6 PROTEONINA COMPRIMA				1	
TOTAL NUMBER OF INDIVIDUALS	56			7	

TABLE F39
EXPERIMENTAL STUDY MEIOFAUNAL DATA: POST-DISPOSAL PHASE SAMPLES.
RAW NUMBER OF INDIVIDUALS OF EACH SPECIES COLLECTED AT STATION 14-3 ON 15 SEP 75

SURF TEMP	SURF SAL	BOT TEMP	BOT SAL	DEPTH	SED TEMP	TIME ON	TIME OFF
28.0	24.0	28.0	30.0		28.0	1315	1410

SEDIMENTS:

SPECIES	REPLICATES 1	2	3	4	5
1 *** NO DATA ***	****	****			
2 MILIOLIDAE				1	72
3 ELPHIDIUM SP.					66
4 AMMONIA BECCARI					16
5 FORAM SP.			15		
6 NEMATODA SP.			4	1	8
7 GASTROPODA SP.					4
8 OSTRACODA A			1	1	
9 PROTEONINA COMPRIMA				2	
TOTAL NUMBER OF INDIVIDUALS			20	5	166

TABLE F40
EXPERIMENTAL STUDY MEIOFAUNAL DATA: POST-DISPOSAL PHASE SAMPLES.
RAW NUMBER OF INDIVIDUALS OF EACH SPECIES COLLECTED AT STATION 14-4 ON 15 SEP 75

SURF TEMP	SURF SAL	BOT TEMP	BOT SAL	DEPTH	SED TEMP	TIME ON	TIME OFF
28.0	25.0	28.0	28.0		28.0	1420	1520

SEDIMENTS:

SPECIES	REPLICATES 1	2	3	4	5
1 *** NO DATA ***	****	****			
2 MILIOLIDAE			124		
3 ELPHIDIUM SP.			34		
4 NEMATODA SP.			20		2
5 NONION CF PAUCILOCULUM			16		
6 AMMONIA BECCARI			12		4
7 ANNELIDA SPP.			10		
8 BIVALVIA SPP.			6		
9 GASTROPODA SP.			4		
10 HARPACTICOIDA A			2		
11 SPIONIDAE					2
12 ACARINA SP.					2
13 OSTRACODA A			2		
TOTAL NUMBER OF INDIVIDUALS			230		10

TABLE F41
EXPERIMENTAL STUDY MEIOFAUNAL DATA: POST-DISPOSAL PHASE SAMPLES.
RAW NUMBER OF INDIVIDUALS OF EACH SPECIES COLLECTED AT STATION 14-5 ON 15 SEP 75

SURF TEMP	SURF SAL	BOT TEMP	BOT SAL	DEPTH	SED TEMP	TIME ON	TIME OFF
28.5	24.5	28.0	29.0		28.0	1530	1600

SEDIMENTS:

SPECIES	REPLICATES 1	2	3	4	5
1 *** NO DATA ***	****				
2 NEMATODA SP.		35	2	6	2
3 FORAM SP.		7	10		
4 AMMONIA BECCARI				4	3
5 MILIOLIDAE				2	5
6 ANNELIDA SPP.			3		3
7 GASTROPODA SP.				2	2
8 PROTEONINA COMPRIMA				4	
9 BIGENERIA IRREGULARIS				2	2
10 OSTRACODA A		1			1
11 ELPHIDIUM SP.				2	
12 NONION CF PAUCILOCULUM				2	
13 OSTRACODA B					2
14 TRACHYDEMUS LANGI		2			
15 ACARINA SP.				2	
16 BIVALVIA SPP.				1	
17 VITRINELLA SP.					1
18 OSTRACODA C					1
TOTAL NUMBER OF INDIVIDUALS		45	15	27	22

TABLE F42
EXPERIMENTAL STUDY MEIOFAUNAL DATA: POST-DISPOSAL PHASE SAMPLES.
RAW NUMBER OF INDIVIDUALS OF EACH SPECIES COLLECTED AT STATION 12-1 ON 16 SEP 75

SURF TEMP	SURF SAL	BOT TEMP	BOT SAL	DEPTH	SED TEMP	TIME ON	TIME OFF
28.0	24.C	28.5	28.0		28.0	1115	1220

SEDIMENTS:

SPECIES	REPLICATES 1	2	3	4	5
1 *** NO DATA ***			****		
2 ELPHIDIUM SP.					200
3 AMMONIA BECCARI	8	8			56
4 NEMATODA SP.	4	8		4	44
5 MILIOLIDAE		4		8	28
6 NONION CF PAUCILOCULUM		8			20
7 BIVALVIA SPP.				4	4
8 OSTRACODA A				8	
9 ANNELIDA SPP.		8			
10 GASTROPODA SP.					8
11 HYDROIDA SP.		4			
12 BIGENERIA IRREGULARIS	4				
TOTAL NUMBER OF INDIVIDUALS	16	40		24	360

TABLE F43
EXPERIMENTAL STUDY MEIOFAUNAL DATA: POST-DISPOSAL PHASE SAMPLES.
RAW NUMBER OF INDIVIDUALS OF EACH SPECIES COLLECTED AT STATION 12-2 ON 16 SEP 75

SURF TEMP	SURF SAL	BOT TEMP	BOT SAL	DEPTH	SED TEMP	TIME ON	TIME OFF
28.5	28.0	29.0	31.0		28.0	1240	1400

SEDIMENTS:

SPECIES	REPLICATES 1	2	3	4	5
1 *** NO DATA ***		****	****		
2 ELPHIDIUM SP.	124				5440
3 MILIOLIDAE	104			56	896
4 AMMONIA BECCARI	28			8	480
5 NONION CF PAUCILOCULUM	136				160
6 NEMATODA SP.	28			4	96
7 GASTROPODA SP.	12				32
8 OSTRACODA A	12				
9 OSTRACODA B	8				
10 BIVALVIA SPP.	4			4	
11 ANNELIDA SPP.				4	
12 HARPACTICOIDA SPP.	4				
TOTAL NUMBER OF INDIVIDUALS	460			76	7104

Fu11

TABLE F44
EXPERIMENTAL STUDY MEIOFAUNAL DATA: POST-DISPOSAL PHASE SAMPLES.
RAW NUMBER OF INDIVIDUALS OF EACH SPECIES COLLECTED AT STATION 12-3 ON 16 SEP 75

SURF TEMP	SURF SAL	BOT TEMP	BOT SAL	DEPTH	SED TEMP	TIME ON	TIME OFF
						9999	9999

SEDIMENTS:

SPECIES	REPLICATES				
	1	2	3	4	5
1 *** NO DATA ***	****	****	****	****	****
TOTAL NUMBER OF INDIVIDUALS					

TABLE F45
EXPERIMENTAL STUDY MEIOFAUNAL DATA: POST-DISPOSAL PHASE SAMPLES.
RAW NUMBER OF INDIVIDUALS OF EACH SPECIES COLLECTED AT STATION 12-4 ON 16 SEP 75

SURF TEMP	SURF SAL	BOT TEMP	BOT SAL	DEPTH	SED TEMP	TIME ON	TIME OFF
28.0	24.0	28.5	30.0		28.5	0950	1100

SEDIMENTS:

SPECIES	REPLICATES 1	2	3	4	5
1 *** NO DATA ***			****		
2 ELPHIDIUM SP.		41			
3 AMMONIA BECCARI	2	23			12
4 MILIOLIDAE	2	1			28
5 NEMATODA SP.		16		4	4
6 NONION CF PAUCILOCULUM		11			
7 BIGENERIA IRREGULARIS				8	
8 OSTRACODA A	4	2			
9 BIVALVIA SPP.					4
10 VITRINELLA SP.	2				
TOTAL NUMBER OF INDIVIDUALS	10	94		12	48

TABLE F46

EXPERIMENTAL STUDY MEIOFAUNAL DATA: POST-DISPOSAL PHASE SAMPLES.

RAW NUMBER OF INDIVIDUALS OF EACH SPECIES COLLECTED AT STATION 12-5 ON 16 SEP 75

SURF TEMP	SURF SAL	BOT TEMP	BOT SAL	DEPTH	SED TEMP	TIME ON	TIME OFF
						9999	9999

SEDIMENTS:

SPECIES	REPLICATES 1	2	3	4	5
1 *** NO DATA ***	****	****	****	****	****
TOTAL NUMBER OF INDIVIDUALS					

TABLE F47
EXPERIMENTAL STUDY MEIOFAUNAL DATA: POST-DISPOSAL PHASE SAMPLES.
RAW NUMBER OF INDIVIDUALS OF EACH SPECIES COLLECTED AT STATION 27-1 ON 17 SEP 75

SURF TEMP	SURF SAL	BOT TEMP	BOT SAL	DEPTH	SED TEMP	TIME ON	TIME OFF
28.0	26.5	28.0	30.0		28.0	1230	1350

SEDIMENTS:

SPECIES	REPLICATES 1	2	3	4	5
1 *** NO DATA ***				****	****
2 ELPHIDIUM SP.		88	2		
3 AMMONIA BECCARI		44	7		
4 FORAM SP.	22				
5 MILIOLIDAE		16	3		
6 NONION CF PAUCILOCULUM		12			
7 PROTEONINA COMPRIMA			7		
8 BIVALVIA SPP.	1	4			
9 OSTRACODA A	3				
10 NEMATODA SP.	1		1		
11 ACARINA SP.	1				
12 AMMOBACULITES CF DILITATUS			1		
13 GASTROPODA SP.			1		
TOTAL NUMBER OF INDIVIDUALS	28	164	22		

TABLE F48
EXPERIMENTAL STUDY MEIOFAUNAL DATA: POST-DISPOSAL PHASE SAMPLES.
RAW NUMBER OF INDIVIDUALS OF EACH SPECIES COLLECTED AT STATION 27-2 ON 17 SEP 75

SURF TEMP	SURF SAL	BOT TEMP	BOT SAL	DEPTH	SED TEMP	TIME ON	TIME OFF
						9999	9999

SEDIMENTS:

SPECIES	REPLICATES 1	2	3	4	5
1 *** NO DATA ***	****	****	****	****	****
TOTAL NUMBER OF INDIVIDUALS					

TABLE F49
EXPERIMENTAL STUDY MEIOFAUNAL DATA: POST-DISPOSAL PHASE SAMPLES.
RAW NUMBER OF INDIVIDUALS OF EACH SPECIES COLLECTED AT STATION 27-3 ON 17 SEP 75

SURF TEMP	SURF SAL	BOT TEMP	BOT SAL	DEPTH	SED TEMP	TIME ON	TIME OFF
28.0	29.0	28.0	32.0		28.0	1430	1500

SEDIMENTS:

SPECIES	REPLICATES 1	2	3	4	5
1 *** NO DATA ***	****				
2 FORAM SP.			41		57
3 MILIOLIDAE		6		29	
4 NEMATODA SP.		2	1	7	4
5 PROTEONINA COMPRIMA				14	
6 OSTRACODA A		2	5	4	2
7 ELPHIDIUM SP.		7		3	
8 ANNELIDA SPP.		9			
9 OSTRACODA B				4	
10 NONION CF PAUCILOCULUM		3			
11 AMMONIA BECCARI		1		1	
12 AMMOBACULITES CF DILITATUS				2	
13 BIGENERIA IRREGULARIS				2	
TOTAL NUMBER OF INDIVIDUALS		30	47	66	63

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TABLE F50
EXPERIMENTAL STUDY MEIOFAUNAL DATA: POST-DISPOSAL PHASE SAMPLES.
RAW NUMBER OF INDIVIDUALS OF EACH SPECIES COLLECTED AT STATION 27-4 ON 17 SEP 75

SURF TEMP	SURF SAL	BOT TEMP	BOT SAL	DEPTH	SED TEMP	TIME ON	TIME OFF
28.5	28.0	28.0	30.0		28.0	1520	1600

SEDIMENTS:

SPECIES	REPLICATES 1	2	3	4	5
1 *** NO DATA ***	****	****	****		
2 ELPHIDIUM SP.				102	
3 AMMONIA BECCARI				44	
4 FORAM SP.					30
5 MILIOLIDAE				18	
6 OSTRACODA A				10	2
7 NONION CF PAUCILOCULUM				6	
8 NEMATODA SP.					3
9 GASTROPODA SP.				2	
10 OSTRACODA B					1
TOTAL NUMBER OF INDIVIDUALS				182	36

TABLE F51
EXPERIMENTAL STUDY MEIOFAUNAL DATA: POST-DISPOSAL PHASE SAMPLES.
RAW NUMBER OF INDIVIDUALS OF EACH SPECIES COLLECTED AT STATION 27-5 ON 17 SEP 75

SURF TEMP	SURF SAL	BOT TEMP	BOT SAL	DEPTH	SED TEMP	TIME ON	TIME OFF
28.0	27.5	28.0	32.0		28.0	1615	1635

SEDIMENTS:

SPECIES	REPLICATES 1	2	3	4	5
1 PROTEONINA COMPRIMA	53	24	47		7
2 AMMONIA BECCARI	13	4	56	2	9
3 MILIOLIDAE	9	12	36		7
4 FORAM SP.				61	
5 ANNELIDA SPP.			5	6	24
6 NEMATODA SP.	1	6	10	4	6
7 ELPHI	10	6	3		3
8 AMMOB LITATUS	5	8	7		
9 OSTRACO	2	4	2	2	2
10 OSTRACODA B	1	4		1	1
11 BIGENERIA IRREGULARIS				2	1
12 GASTROPODA SP.	1				1
13 ACARINA SP.		2			
14 BIVALVIA SPP.	1				
15 TRACHYDEMUS LANGI				1	
TOTAL NUMBER OF INDIVIDUALS	96	70	166	79	61

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TABLE F52
EXPERIMENTAL STUDY MEIOFAUNAL DATA: POST-DISPOSAL PHASE SAMPLES.
RAW NUMBER OF INDIVIDUALS OF EACH SPECIES COLLECTED AT STATION 2-1 ON 23 NOV 75

SURF TEMP	SURF SAL	BOT TEMP	BOT SAL	DEPTH	SED TEMP	TIME ON	TIME OFF
16.0	24.0	17.5	25.5	10.0	19.5	1435	1505

SEDIMENTS:

	SPECIES	REPLICATES 1	2	3	4	5
1	***NO DATA***	****		****	****	
2	NEMATODA		135			54
3	AMMONIA BECCARI		54			135
4	ELPHIDIUM SPP.		108			108
5	NONION SP.		27			
6	MILIOLIDAE		135			135
7	BULIMNOIDES		81			
8	PROTEONINA COMPRINA					27
9	BIGENERINA IRREGULARIS					27
10	BULIMINELLA SPP.					297
11	TRACHYDEMUS LANGI					27
	TOTAL NUMBER OF INDIVIDUALS		540			810

TABLE F53
EXPERIMENTAL STUDY MEIOFAUNAL DATA: POST-DISPOSAL PHASE SAMPLES.
RAW NUMBER OF INDIVIDUALS OF EACH SPECIES COLLECTED AT STATION 2-2 ON 25 NOV 75

SURF TEMP	SURF SAL	BOT TEMP	BOT SAL	DEPTH	SED TEMP	TIME ON	TIME OFF
18.0	26.0	20.0	30.0	10.5	21.0	0917	1005

SEDIMENTS:

	SPECIES	REPLICATES 1	2	3	4	5
1	***NO DATA***		****	****	****	****
2	NEMATODA	450				
3	AMMONIA BECCARI	255				
4	ELPHIDIUM SPP.	30				
5	MILIOLIDAE	570				
6	PROTEONINA COMPRINA	30				
7	BIGENERINA IRREGULARIS	15				
8	AMMOBACULITES SP.	45				
9	BULIMINELLA SPP.	60				
10	OSTRACOD B	60				
	TOTAL NUMBER OF INDIVIDUALS	1515				

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TABLE F54

EXPERIMENTAL STUDY MEIOFAUNAL DATA: POST-DISPOSAL PHASE SAMPLES.

RAW NUMBER OF INDIVIDUALS OF EACH SPECIES COLLECTED AT STATION 2-3 ON 25 NOV 75

SURF TEMP	SURF SAL	BOT TEMP	BOT SAL	DEPTH	SED TEMP	TIME ON	TIME OFF
18.0	25.0	20.0	28.0	11.0	18.0	0817	0900

SEDIMENTS:

	SPECIES	REPLICATES 1	2	3	4	5
1	***NO DATA***		****	****		
2	NEMATODA	108			81	
3	AMMONIA BECCARI	216			243	81
4	MILIOLIDAE	297			27	81
5	PROTEONINA COMPRINA	81				27
6	AMMOBACULITES CF DILITATUS	54				
7	BULIMINELLA SPP.	27				
8	NONION SP.				27	
9	BULIMINOIDES SP.				27	54
10	OSTRACOD A				27	54
11	PYCNOPHYES SP.					27
	TOTAL NUMBER OF INDIVIDUALS	783			432	324

TABLE F55
EXPERIMENTAL STUDY MEIOFAUNAL DATA: POST-DISPOSAL PHASE SAMPLES.
RAW NUMBER OF INDIVIDUALS OF EACH SPECIES COLLECTED AT STATION 2-4 ON 25 NOV 75

SURF TEMP	SURF SAL	BOT TEMP	BOT SAL	DEPTH	SED TEMP	TIME ON	TIME OFF
18.0	28.0	18.0	30.0	11.0	20.5	1225	1305

SEDIMENTS:

	SPECIES	REPLICATES				
		1	2	3	4	5
1	***NO DATA***			****	****	
2	NEMATODA	480	1035			75
3	AMMONIA BECCARI	120	195			90
4	NONION SP.	15				
5	MILIOLIDAE	75	435			120
6	BULIMINOIDES SPP.	75				
7	BIGENERINA IRREGULARIS	15	45			15
8	ECHINODERES REMANI	15				
9	OSTRACOD A	15				
10	HARPACTICOIDA	75	30			15
11	ELPHIDIUM SP.		15			
12	TRACHYDEMUS LANGI		30			
13	BULIMINELLA SPP.		135			60
14	AMMOBACULITES SP.					15
	TOTAL NUMBER OF INDIVIDUALS	885	1920			315

TABLE F56
EXPERIMENTAL STUDY MEIOFAUNAL DATA: POST-DISPOSAL PHASE SAMPLES.
RAW NUMBER OF INDIVIDUALS OF EACH SPECIES COLLECTED AT STATION 2-5 ON 25 NOV 75

SURF TEMP	SURF SAL	BOT TEMP	BOT SAL	DEPTH	SED TEMP	TIME ON	TIME OFF
18.0	25.5	19.5	29.0	11.0	22.0	1140	1200

SEDIMENTS:

SPECIES	REPLICATES 1	2	3	4	5
	****	****		****	****
1 ***NO DATA***					
2 NEMATODA			24		
3 AMMONIA BECCARI			8		
TOTAL NUMBER OF INDIVIDUALS			32		

TABLE F57
EXPERIMENTAL STUDY MEIOFAUNAL DATA: POST-DISPOSAL PHASE SAMPLES.
RAW NUMBER OF INDIVIDUALS OF EACH SPECIES COLLECTED AT STATION 15-1 ON 4 DEC 75

SURF TEMP	SURF SAL	BOT TEMP	BOT SAL	DEPTH	SED TEMP	TIME ON	TIME OFF
16.0	27.0	16.0	29.0	8.0	17.0	1620	1640

SEDIMENTS:

	SPECIES	REPLICATES 1	2	3	4	5
1	***NO DATA***	****				****
2	NEMATODA			405	630	
3	AMMONIA BECCARI		75	105	75	
4	ELPHIDIUM SPP.		15	30		
5	BIGENERINA IRREGULARIS		15			
6	AMMOBACULITES SPP.		45			
7	BULIMINELLA SPP.		15	30	15	
8	NONIONELLA SPP.				15	
9	MILIOLIDAE				15	
10	HARPACTICOIDA			15		
	TOTAL NUMBER OF INDIVIDUALS		165	585	675	

TABLE F58

EXPERIMENTAL STUDY MEIOFAUNAL DATA: POST-DISPOSAL PHASE SAMPLES.

RAW NUMBER OF INDIVIDUALS OF EACH SPECIES COLLECTED AT STATION 15-2 ON 4 DEC 75

SURF TEMP	SURF SAL	BOT TEMP	BOT SAL	DEPTH	SED TEMP	TIME ON	TIME OFF
16.5	29.0	17.0	30.5	8.0	17.0	1345	1415

SEDIMENTS:

	SPECIES	REPLICATES 1	2	3	4	5
1	***NO DATA***	****				
2	NEMATODA		293	210	60	120
3	AMMONIA BECCARI		240	135	90	90
4	MILIOLIDAE		175	15	15	15
5	BULIMINELLA		60	75		15
6	AMMOBACULITES SPP.			15		
7	ELPHIDIUM SPP.					30
8	BIGENERINA IRREGULARIS					15
9	OSTRACOD A				15	15
10	SIGAMBRA SPP.					15
	TOTAL NUMBER OF INDIVIDUALS		768	450	180	315

TABLE F59
EXPERIMENTAL STUDY MEIOFAUNAL DATA: POST-DISPOSAL PHASE SAMPLES.
RAW NUMBER OF INDIVIDUALS OF EACH SPECIES COLLECTED AT STATION 15-3 ON 4 DEC 75

SURF TEMP	SURF SAL	BOT TEMP	BOT SAL	DEPTH	SED TEMP	TIME ON	TIME OFF
16.5	28.5	17.0	31.5	8.0	17.0	1300	1335

SEDIMENTS:

	SPECIES	REPLICATES 1	2	3	4	5
1	***NO DATA***	****	****			
2	NEMATODA			285	15	91
3	AMMONIA BECCARI			150	615	294
4	ELPHIDIUM SPP.			15	45	14
5	MILIOLIDAE			45	120	28
6	BIGENERINA IRREGULARIS			30	15	21
7	BULIMINELLA SPP.			75	75	119
8	NONION SPP.				15	7
9	PROTEONINA COMPRINA				75	7
10	AMMOBACULITES SPP.				45	
	TOTAL NUMBER OF INDIVIDUALS			600	1020	581

TABLE F60
EXPERIMENTAL STUDY MEIOFAUNAL DATA: POST-DISPOSAL PHASE SAMPLES.
RAW NUMBER OF INDIVIDUALS OF EACH SPECIES COLLECTED AT STATION 15-4 ON 4 DEC 75

SURF TEMP	SURF SAL	BOT TEMP	BOT SAL	DEPTH	SED TEMP	TIME ON	TIME OFF
16.5	28.0	16.5	30.0	8.0	17.0	1500	1545

SEDIMENTS:

	SPECIES	REPLICATES 1	2	3	4	5
1	NEMATODA	60	345	28	240	75
2	AMMONIA BECCARI	60	135	105	135	45
3	ELPHIDIUM SPP.	45		56		15
4	BIGENERINA IRREGULARIS	15	30	7		
5	NONIONELLA SPP.	15			15	
6	BULIMINELLA SPP.	45	105	77	30	75
7	MILIOLIDAE		15	56	135	
8	AMMOBACULITES SPP.		15		15	15
9	HARPACTICOIDA	15			30	
10	HARPACTICOIDA IMMATURE					15
11	OSTRACOD B			7		
12	ANNELIDA	15		7		
13	PRIONOSPIA PINNATA		15			
14	ECHINODERES REMANI					15
	TOTAL NUMBER OF INDIVIDUALS	270	660	287	600	255

TABLE F61
EXPERIMENTAL STUDY MEIOFAUNAL DATA: POST-DISPOSAL PHASE SAMPLES.
RAW NUMBER OF INDIVIDUALS OF EACH SPECIES COLLECTED AT STATION 15-5 ON 4 DEC 75

SURF TEMP	SURF SAL	BOT TEMP	BOT SAL	DEPTH	SED TEMP	TIME ON	TIME OFF
17.0	29.0	17.5	30.0	8.0	17.5	1430	1445

SEDIMENTS:

	SPECIES	REPLICATES 1	2	3	4	5
1	***NO DATA***		****			
2	NEMATODA	15		75	90	60
3	AMMONIA BECCARI	120		195	315	165
4	MILIOLIDAE	45		30	60	75
5	PROTEONINA COMPRINA	15		45	30	
6	AMMOBACULITES SPP.	30		15		45
7	BULIMINELLA SPP.	45		165	30	60
8	BIGENERINA IRREGULARIS			15	15	
9	HARPACTICOIDA			30		
10	HARPACTICOIDA IMMATURE			15		
	TOTAL NUMBER OF INDIVIDUALS	270		585	540	405

TABLE F62
EXPERIMENTAL STUDY MEIOFAUNAL DATA: POST-DISPOSAL PHASE SAMPLES.
RAW NUMBER OF INDIVIDUALS OF EACH SPECIES COLLECTED AT STATION 14-1 ON 24 NOV 75

SURF TEMP	SURF SAL	BOT TEMP	BOT SAL	DEPTH	SED TEMP	TIME ON	TIME OFF
17.0		21.0		16.0	21.0	1515	1605

SEDIMENTS:

	SPECIES	REPLICATES 1	2	3	4	5
1	NEMATODA	150	162	45	255	75
2	AMMONIA BECCARI	180	162	45	120	135
3	ELPHIDIUM SPP.	15				45
4	MILIOLIDAE SPP.	15	162	45	30	30
5	PROTEONINA COMPRINA	15		45	60	45
6	BIGENERINA IRREGULARIS	15			45	
7	BULIMINELLA SP.	45	27		30	45
8	NONIONELLA SP.					15
9	ECHINODERES REMANI				15	
10	OSTRACOD B	30				
11	OSTRACOD C	15				
12	COSSURA DELTA		27			
13	CAPITELLIDAE				15	
	TOTAL NUMBER OF INDIVIDUALS	480	378	180	570	390

F1.

TABLE F63
EXPERIMENTAL STUDY MEIOFAUNAL DATA: POST-DISPOSAL PHASE SAMPLES.
RAW NUMBER OF INDIVIDUALS OF EACH SPECIES COLLECTED AT STATION 14-2 ON 24 NOV 75

SURF TEMP	SURF SAL	BOT TEMP	BOT SAL	DEPTH	SED TEMP	TIME ON	TIME OFF
16.5		21.0		16.0	21.0	1630	1710

SEDIMENTS:

	SPECIES	REPLICATES 1	2	3	4	5
1	NEMATODA	150	120	330	999	390
2	AMMONIA BECCARI		60	375	287	60
3	ELPHIDIUM SP.	30		450	81	30
4	MILIOLIDAE SPP.	15		60	675	30
5	BULIMINOIDES SP.		15			120
6	PROTEONINA COMPRINA			30		
7	BIGENERINA IRREGULARIS			30	54	30
8	BULIMINELLA SP.			75	81	
9	TRACHYDEMUS LANGI				27	
10	ECHINODERES REMANI				27	
11	OSTRACODA			15		
12	HARPACTICOIDA			15	54	60
13	BIVALVIA			15		
14	OSTRACOD A				27	30
15	HARPACTICOIDA IMMATURE				135	
16	ACARINA				27	
17	ANNELIDA					120
	TOTAL NUMBER OF INDIVIDUALS	195	195	1425	2474	870

TABLE F64
EXPERIMENTAL STUDY MEIOFAUNAL DATA: POST-DISPOSAL PHASE SAMPLES.
RAW NUMBER OF INDIVIDUALS OF EACH SPECIES COLLECTED AT STATION 14-3 ON 24 NOV 75

SURF TEMP	SURF SAL	BOT TEMP	BOT SAL	DEPTH	SED TEMP	TIME ON	TIME OFF
16.5		21.0		16.0	21.5	1125	1235

SEDIMENTS:

	SPECIES	REPLICATES 1	2	3	4	5
1	***NO DATA***	****	****			
2	NEMATODA			27	52	32
3	AMMONIA BECCARI			135	7	1
4	ELPHIDIUM SP.					1
5	MILIOLIDAE SPP.				6	1
6	PROTOENINA COMPRINA			27		
7	BIGENERINA IRREGULARIS			27		
8	BULIMINELLA SP.			54	5	1
9	PYCNOPHYES SP.				2	
10	OSTRACOD A				1	
11	OSTRACOD B			27	1	
12	HARPACTICOIDA				2	
13	BIVALVIA					2
14	PELARGIDAE IMMATURE					1
15	ACARINA				2	
	TOTAL NUMBER OF INDIVIDUALS			297	78	39

TABLE F65
EXPERIMENTAL STUDY MEIOFAUNAL DATA: POST-DISPOSAL PHASE SAMPLES.
RAW NUMBER OF INDIVIDUALS OF EACH SPECIES COLLECTED AT STATION 14-4 ON 24 NOV 75

SURF TEMP	SURF SAL	BOT TEMP	BOT SAL	DEPTH	SED TEMP	TIME ON	TIME OFF
17.0		21.5		16.0	20.5	1430	1505

SEDIMENTS:

	SPECIES	REPLICATES 1	2	3	4	5
1	***NO DATA***	****	****		****	
2	NEMATODA			375		315
3	AMMONIA BECCARI			315		210
4	ELPHIDIUM SPP.			195		30
5	NONION SP.			15		
6	MILIOLIDAE SPP.			30		90
7	PROTEONINA COMPRINA			30		15
8	BIGENERINA IRREGULARIS			15		
9	BULIMINELLA SP.					90
10	ECHINODERES REMANI					30
11	PYCNOPHYES SP.					15
12	OSTRACODA			30		
13	HARPACTICOIDA			15		
14	BIVALVIA SPP.			45		30
	TOTAL NUMBER OF INDIVIDUALS			1065		825

TABLE F66

EXPERIMENTAL STUDY MEIOFAUNAL DATA: POST-DISPOSAL PHASE SAMPLES.

RAW NUMBER OF INDIVIDUALS OF EACH SPECIES COLLECTED AT STATION 14-5 ON 24 NOV 75

SURF TEMP	SURF SAL	BOT TEMP	BOT SAL	DEPTH	SED TEMP	TIME ON	TIME OFF
16.0		21.0		16.0	21.0	1255	1410

SEDIMENTS:

	SPECIES	REPLICATES 1	2	3	4	5
1	***NO DATA***		****			
2	NEMATODA	216		165	120	510
3	AMMONIA BECCARI	324		330	210	375
4	NONION SP.	27				15
5	MILIOLIDAE SPP.	243		60	15	180
6	PROTEONINA COMPRINA	81		60	60	120
7	NONIONELLA SP.	27				
8	BULIMINELLA SPP.	27		30	15	135
9	BIGENERINA IRREGULARIS			30	15	45
10	ELPHIDIUM SPP.			105	75	30
11	ECHINODERES REMANI				15	30
12	PYCNOPHYES SP.					45
13	OSTRACOD A					15
14	OSTRACOD B	27		15		15
15	HARPACTICOIDA				15	60
16	HARPACTICOIDA IMMATURE				15	15
17	BIVALVIA SP.			15		
18	TELLINA SP.					15
19	GASTROPODA					15
20	PELARGIDAE					15
21	PELARGIDAE IMMATURE					15
22	SPIONIDAE IMMATURE					15
23	ACARINA					15
	TOTAL NUMBER OF INDIVIDUALS	972		840	555	1710

TABLE F67
EXPERIMENTAL STUDY MEIOFAUNAL DATA: POST-DISPOSAL PHASE SAMPLES.
RAW NUMBER OF INDIVIDUALS OF EACH SPECIES COLLECTED AT STATION 12-1 ON 3 DEC 75

SURF TEMP	SURF SAL	BOT TEMP	BOT SAL	DEPTH	SED TEMP	TIME ON	TIME OFF
15.0	28.0	17.0	30.0	11.0	17.0	0830	0930

SEDIMENTS:

	SPECIES	REPLICATES 1	2	3	4	5
1	***NO DATA***	****				
2	NEMATODA		15	458	318	8
3	AMMONIA BECCARI		15	45	83	38
4	ELPHIDIUM SPP.		15		23	
5	NONION SPP.		15			
6	MILIOLIDAE SPP		90	8	15	30
7	PROTOENINA COMPRINA		30	30		8
8	BULIMINELLA SPP.		15	15		
9	BULMINOIDES SPP.			8	60	8
10	BIGENERINA IRREGULARIS			8	8	8
11	AMMOBACULITES SPP.			8	8	
12	OSTRACOD A		15			
13	OSTRACOD B		30			
14	HARPACTICOIDA			15	38	
15	HARPACTICOIDA IMMATURE			8		
16	DESMOSCOLEX SPP.				8	
17	PYCNOPHYES SPP.				8	
	TOTAL NUMBER OF INDIVIDUALS		240	603	569	100

TABLE F68

EXPERIMENTAL STUDY MEIOFAUNAL DATA: POST-DISPOSAL PHASE SAMPLES.

RAW NUMBER OF INDIVIDUALS OF EACH SPECIES COLLECTED AT STATION 12-2 ON 3 DEC 75

SURF TEMP	SURF SAL	BOT TEMP	BOT SAL	DEPTH	SED TEMP	TIME ON	TIME OFF
15.5	28.0	16.5	30.0	11.0	17.5	0940	1040

SEDIMENTS:

	SPECIES	REPLICATES 1	2	3	4	5
1	***NO DATA***			****	****	****
2	NEMATODA	188	160			
3	AMMONIA BECCARI	300	278			
4	MILIOLIDAE	15	30			
5	PROTEONINA COMPRINA	105	45			
6	BULIMINOIDES SPP.	8	8			
7	ELPHIDIUM SPP.	8	15			
8	BIGENERINA IRREGULARIS	8				
9	AMMOBACULITES SPP.	8	8			
10	BULIMINELLA SPP.	53	23			
11	OSTRACOD A	8				
12	OSTRACOD B		8			
13	NONION SPP.		38			
14	ANNELIDA		23			
	TOTAL NUMBER OF INDIVIDUALS	701	636			

TABLE F69
EXPERIMENTAL STUDY MEIOFAUNAL DATA: POST-DISPOSAL PHASE SAMPLES.
RAW NUMBER OF INDIVIDUALS OF EACH SPECIES COLLECTED AT STATION 12-3 ON 3 DEC 75

SURF TEMP	SURF SAL	BOT TEMP	BOT SAL	DEPTH	SED TEMP	TIME ON	TIME OFF
16.0	30.0	17.0	32.0	11.0	17.0	1050	1145

SEDIMENTS:

	SPECIES	REPLICATES 1	2	3	4	5
1	***NO DATA***	****	****		****	
2	AMMONIA BECCARI			23		15
3	ELPHIDIUM SPP.			23		45
4	NONION SPP.			15		
5	HARPACTICOIDA			8		
6	GASTROPODA			8		
7	NEMATODA					90
8	BIGENERINA IRREGULARIS					23
9	PROTEONINA COMPRINA					8
10	AMMOBACULITES SPP.					8
11	BULIMINELLA SPP.					15
	TOTAL NUMBER OF INDIVIDUALS			77		204

TABLE F70

EXPERIMENTAL STUDY MEIOFAUNAL DATA: POST-DISPOSAL PHASE SAMPLES.

RAW NUMBER OF INDIVIDUALS OF EACH SPECIES COLLECTED AT STATION 12-4 ON 3 DEC 75

SURF TEMP	SURF SAL	BOT TEMP	BOT SAL	DEPTH	SED TEMP	TIME ON	TIME OFF
16.0	27.0	17.0	31.0	12.0	17.5	1410	1430

SEDIMENTS:

	SPECIES	REPLICATES 1	2	3	4	5
1	NEMATODA	168	104	128	30	195
2	AMMONIA BECCARI	45	127	165	15	15
3	BULIMINOIDES SPP.	8	21			
4	HARPACTICOIDA	8	7			8
5	ANNELIDA	30				
6	NONION SPP.		4			
7	MILIOLIDAE SPP.		4		75	
8	AMMOBACULITES SPP.		12			
9	PROTEONINA COMPRINA		3	45	30	
10	OSTRACOD A		1			
11	OSTRACOD B		1			
12	BULIMINELLA SPP.		2	53		23
13	BIGENERINA IRREGULARIS			8		
14	TRACHYDEMUS LANGI			8		8
15	PYCNOPHYES			8		
16	BIVALVIA			8		
17	HARPACTICOID IMMATURE			8		8
18	ECHINODERES REMANI					8
	TOTAL NUMBER OF INDIVIDUALS	259	294	431	150	265

TABLE F71

EXPERIMENTAL STUDY MEIOFAUNAL DATA: POST-DISPOSAL PHASE SAMPLES.

RAW NUMBER OF INDIVIDUALS OF EACH SPECIES COLLECTED AT STATION 12-5 ON 3 DEC 1975

SURF TEMP	SURF SAL	BOT TEMP	BOT SAL	DEPTH	SED TEMP	TIME ON	TIME OFF
17.0	27.0	17.0	31.0	12.0	17.0	1345	1425

SEDIMENTS:

	SPECIES	REPLICATES				
		1	2	3	4	5
1	***NO DATA***	****				
2	NEMATODA		68	90	113	45
3	AMMONIA BECCARI		68	8	90	45
4	NONION SPP.		8	8	8	8
5	PROTEONINA COMPRINA		8		8	8
6	BIGENERINA IRREGULARIS		15		8	
7	BULIMINELLA SPP.		15		15	8
8	MILIOLIDAE SPP.		15	60	15	
9	AMMOBACULITES SPP.		8		8	
10	BULIMINOIDES SPP.		15			
11	ELPHIDIUM SPP.			83	30	8
12	OSTRACOD A			8		
13	BIVALVIA		15			
14	ANNELIDA			8		10
15	FORAMINIFERA					8
	TOTAL NUMBER OF INDIVIDUALS		235	265	295	140

TABLE F72
EXPERIMENTAL STUDY MEIOFAUNAL DATA: POST-DISPOSAL PHASE SAMPLES.
RAW NUMBER OF INDIVIDUALS OF EACH SPECIES COLLECTED AT STATION 27-1 ON 4 DEC 75

SURF TEMP	SURF SAL	BOT TEMP	BOT SAL	DEPTH	SED TEMP	TIME ON	TIME OFF
16.5	25.5	17.0	30.0	13.0	18.0	1545	1615

SEDIMENTS:

	SPECIES	REPLICATES 1	2	3	4	5
1	***NO DATA***		****	****		****
2	NEMATODA	255			488	
3	AMMONIA BECCARI	315			136	
4	ELPHIDIUM SPP.	30				
5	PROTEONINA COMPRINA	180				
6	BIGENERINA IRREGULARIS	60				
7	BULIMINOIDES SPP.				48	
8	TRACHYDEMUS LANGI				8	
9	ECHINODERES REMANI				8	
10	PYCNOPHYES SP.				8	
11	OSTRACOD B				8	
12	HARPACTICOID IMMATURE				8	
	TOTAL NUMBER OF INDIVIDUALS	840			712	

TABLE F73
EXPERIMENTAL STUDY MEIOFAUNAL DATA: POST-DISPOSAL PHASE SAMPLES.
RAW NUMBER OF INDIVIDUALS OF EACH SPECIES COLLECTED AT STATION 27-2 ON 4 DEC 75

SURF TEMP	SURF SAL	BOT TEMP	BOT SAL	DEPTH	SED TEMP	TIME ON	TIME OFF
17.0	30.0	17.0	31.0	13.0	17.0	0945	1030

SEDIMENTS:

	SPECIES	REPLICATES 1	2	3	4	5
1	***NO DATA***				****	
2	NEMATODA	90	189	345		180
3	AMMONIA BECCARI	105	301	45		30
4	BIGENERINA IRREGULARIS	30	77			
5	BULIMINELLA SPP.	30	273	60		105
6	PROTEONINA COMPRINA		35			
7	AMMOBACULITES SP.		14			
8	DESMOSCOLEX SP.		14	60		
9	PYCNOPHYES SPP.		7			
10	HARPACTICOIDA		7	30		
11	ECHINODERES REMANI			15		
12	OSTRACOD A			15		
13	HARPACTICOIDA IMMATURE			15		
	TOTAL NUMBER OF INDIVIDUALS	255	917	585		315

TABLE F74
EXPERIMENTAL STUDY MEIOFAUNAL DATA: POST-DISPOSAL PHASE SAMPLES.
RAW NUMBER OF INDIVIDUALS OF EACH SPECIES COLLECTED AT STATION 27-3 ON 4 DEC 75

SURF TEMP	SURF SAL	BOT TEMP	BOT SAL	DEPTH	SED TEMP	TIME ON	TIME OFF
16.5	29.0	17.0	30.0	13.0	17.0	0850	0935

SEDIMENTS:

	SPECIES	REPLICATES 1	2	3	4	5
1	***NO DATA***				****	
2	NEMATODA	112	300	240		230
3	AMMONIA BECCARI	80	45	173		161
4	BULIMINOIDES SPP.	80				
5	PROTEONINA COMPRINA	8		5		5
6	BIGENERINA IRREGULARIS	8	30	5		27
7	MILIOLIDAE		15	10		7
8	BULIMINELLA SPP.		30	35		131
9	HARPACTICOIDA SPP.		15	5		2
10	AMMOBACULITES SPP.			5		5
11	TRACHYDEMUS LANGI			5		
12	HARPACTICOIDA SPP. IMMATURE					7
13	OSTRACOD B					2
14	ELPHIDIUM SPP.					15
	TOTAL NUMBER OF INDIVIDUALS	288	435	483		592

TABLE F76

EXPERIMENTAL STUDY MEIOFAUNAL DATA: POST-DISPOSAL PHASE SAMPLES.

RAW NUMBER OF INDIVIDUALS OF EACH SPECIES COLLECTED AT STATION 27-5 ON 4 DEC 75

SURF TEMP	SURF SAL	BOT TEMP	BOT SAL	DEPTH	SED TEMP	TIME ON	TIME OFF
17.0	30.0	18.0	31.0	13.0	17.0	1045	1115

SEDIMENTS:

	SPECIES	REPLICATES 1	2	3	4	5
1	NEMATODA	360	315	28	675	390
2	AMMONIA BECCARI		126			75
3	ELPHIDIUM SPP.		28	7		
4	MILIOLIDAE		14			
5	PROTEONINA COMPRINA					15
6	BIGENERINA IRREGULARIS	15	7			15
7	BULIMINELLA SPP.	75	56	21		105
8	ECHINODERES REMANI		14			
9	PYCNOPHYES SP.		14	7		
10	HARPACTICOIDA		28			45
11	HARPACTICOIDA IMMATURE	60	28		15	30
12	LUMBRINARUS SPP.					15
13	DESMOSCOLEX SPP.				15	15
	TOTAL NUMBER OF INDIVIDUALS	435	630	63	705	705

APPENDIX G

RAW NEKTON DATA FROM THE EXPERIMENTAL STUDY

Table G1. Numbers of individuals of the species collected in three 5 minute trawls in block 2 on 24 July 1975.

Time on:	0955	Surface temp:	28.0	Surface sal:	-
Time off:	1029	Bottom temp:	28.0	Bottom sal:	-

Species	Size Class (cm)	Trawl 1	2	3	$\bar{X}$
VERTEBRATES					
Leiostomus xanthurus	< 10	15	7		7.3
	10-20	7	2	4	4.3
	TOTAL	22	9	4	11.6
Symphurus civitatus	< 10	7	7		4.6
	10-20	1	12	8	7.0
	TOTAL	8	19	8	11.6
Micropogon undulatus	< 10			5	1.6
	10-20		5	10	5.0
	TOTAL		5	15	6.6
Arius felis	< 10			13	4.3
	10-20		1		0.3
	20-30	3		1	1.3
	TOTAL	3	1	14	6.0
Polydactylus octonemus	< 10	5			1.6
	10-20		7	3	3.3
	TOTAL	5	7	3	5.0
Cynoscion arenarius	< 10	5	2	3	3.3
	10-20		3	1	1.3
	TOTAL	5	5	4	4.6
Prionotus rubio	< 10	4	4	2	3.3
	10-20		2		0.6
	TOTAL	4	6	2	4.0
Menticirrhus americanus	< 10	5			1.6
	10-20	2			0.6
	TOTAL	7			2.3
Stellifer lanceolatus	< 10	5			1.6
	10-20			1	0.3
	TOTAL	5		1	2.0
NEKTONIC INVERTEBRATES					
Penaeus aztecus	< 10	33	2	3	12.6
	10-20	25	32	9	22.0
	TOTAL	58	34	12	34.6

Tabel Gl (continued)

Species	Size Class (cm)	Trawl 1	2	3	$\bar{X}$
NEKTONIC INVERTEBRATES (con'd)					
Callinectes similis	< 10		6	5	3.6
Loliguncula brevis	< 10	2	3	5	3.3
Callinectes sapidus	< 10		1		0.3
	10-20	2	1	1	1.3
	TOTAL	2	2	1	1.6
Penaeus setiferus	10-20			1	0.3
BENTHIC MACROINVERTEBRATES					
Pagurus pollicaris	< 10	67	93	64	74.6
Busycon spiratum	< 10		2	1	1.0
	10-20	2			0.6
	TOTAL	2	2	1	1.6
Panopeus turgidus	< 10		3		1.0
Libinia dubia	< 10		1	2	1.0
Squilla empusa	< 10		1	1	0.6
Actinaria, unID	< 10	2			0.6
Lunarca ovalis	< 10		1		0.3
Anadara brasiliana	< 10			1	0.3
Polinices duplicatus	< 10			1	0.3
Thyone briareus	< 10		1		0.3
Summary					
Biomass (gm)		2723	2167	1531	2140
Vertebrates					
species		8	7	8	7.6
individuals		59	52	51	54.0
Nektonic Invertebrates					
species		3	4	5	4.0
individuals		62	45	24	43.6

Table G1 (continued)

Species	Size Class (cm)	Trawl 1	2	3	$\bar{X}$
Summary (con'd)					
Benthic Macroinvertebrates					
species		3	7	6	6.0
individuals		71	102	70	81.0
Total					
species		14	18	19	17.0
individuals		192	199	145	178.6

The block: 24 spp.; 536 ind.

Table G2. Numbers of individuals of the species collected in three 5 minute trawls in block 15 on 24 July 1975.

Time on:	1530	Surface temp:	28.5	Surface sal:	-
Time off:	1620	Bottom temp:	28.0	Bottom sal:	-

Species	Size Class (cm)	Trawl 1	2	3	$\bar{X}$
<u>VERTEBRATES</u>					
Symphurus civitatus	< 10	9	2	3	4.6
	10-20	16	12	10	12.6
	TOTAL	25	14	13	17.3
Micropogon undulatus	< 10			3	1.0
	10-20	4	14	1	6.3
	TOTAL	4	14	4	7.3
Polydactylus octonemus	10-20	2	2	2	2.0
Chaetodipterus faber	< 10	2	1	1	1.3
Larimus fasciatus	10-20			2	0.6
Citharichthys spilopterus	10-20	1			0.3
Prionotus rubio	< 10		1		0.3
Prionotus tribulus	10-20			1	0.3
Stellifer lanceolatus	10-20	1			0.3
<u>NEKTONIC INVERTEBRATES</u>					
Penaeus aztecus	< 10	8	4	1	4.3
	10-20	44	46	4	31.3
	TOTAL	52	50	5	35.6
Callinectes similis	< 10	13	14	6	11.0
Loliguncula brevis	< 10			5	1.6
Trachypeneus similis	< 10	1		3	1.3
Scyphozoa, unID	< 10	1			0.3
<u>BENTHIC MACROINVERTEBRATES</u>					
Pagurus pollicaris	< 10	21	26	17	21.3
Actinaria, unID	< 10	3	3	4	3.3

Table G2 (continued)

Species	Size Class (cm)	Trawl 1	Trawl 2	Trawl 3	$\bar{X}$
<u>BENTHIC MACROINVERTEBRATES</u> (con'd)					
Thais haemastoma	< 10	4	4		2.6
Sinum perspectivum	< 10	2	1	1	1.3
Bivalvia, unID	< 10		4		1.3
Squilla empusa	< 10	1		2	1.0
Anadara brasiliana	< 10		2		0.6
Polinices duplicatus	< 10		1	1	0.6
Hepatus epheliticus	< 10	1			0.3
Libinia dubia	< 10		1		0.3
Summary					
Biomass (gm)		1071	1018	388	825.6
Vertebrates					
species		6	5	6	5.6
individuals		35	32	23	30.0
Nektonic Invertebrates					
species		4	2	4	3.3
individuals		67	64	19	50.0
Benthic Macroinvertebrates					
species		6	8	5	6.6
individuals		32	42	25	33.0
Total					
species		16	15	16	15.6
individuals		134	138	67	113.0

The block: 24 spp.; 339 ind.

Table G3. Numbers of individuals of the species collected in three 5 minute trawls in block 12 on 24 July 1975.

Time on:	1100	Surface temp:	28.0	Surface sal:	-
Time off:	1140	Bottom temp:	28.0	Bottom sal:	-

Species	Size Class (cm)	Trawl 1	Trawl 2	Trawl 3	$\bar{X}$
VERTEBRATES					
Polydactylus octonemus	10-20	15	11	7	11.0
Prionotus rubio	< 10	10	6	12	9.3
	10-20		3	1	1.3
	TOTAL	10	9	13	10.6
Chaetodipterus faber	< 10	6	4	14	8.0
Micropogon undulatus	< 10	1			0.3
	10-20	9	1	6	5.3
	TOTAL	10	1	6	5.6
Symphurus civitatus	< 10	1	2	2	1.6
	10-20	3	2	3	2.6
	TOTAL	4	4	5	4.3
Cynoscion arenarius	< 10	5	4	1	3.3
	10-20		1		0.3
	TOTAL	5	5	1	3.6
Stellifer lanceolatus	< 10	6			2.0
	10-20	3			1.0
	TOTAL	9			3.0
Trichiurus lepturus	20-30	3			1.0
	30-40		2		0.6
	TOTAL	3	2		1.6
Chloroscombrus chrysurus	10-20	4		1	1.6
Leiostomus xanthurus	10-20	3	1		1.3
Arius felis	10-20	1			0.3
Cynoscion nothus	10-20	1			0.3
Peprilus alepidotus	< 10		1		0.3
NEKTONIC INVERTEBRATES					
Penaeus aztecus	< 10	2			0.6
	10-20	5	17	31	17.6
	TOTAL	7	17	31	18.3

Table G3 (continued)

Species	Size Class (cm)	Trawl 1	2	3	$\bar{X}$
NEKTONIC INVERTEBRATES (con'd)					
Callinectes similis	< 10	11	13	22	15.3
Penaeus setiferus	< 10			2	0.6
	10-20	3			1.0
	TOTAL	3		2	1.6
Calinectes sapidus	< 10		1		0.3
	10-20	2	1	1	1.3
	TOTAL	2	2	1	1.6
Loliguncula brevis	< 10	2	1	2	1.6
BENTHIC MACROINVERTEBRATES					
Cantharus cancellarius	< 10	4	1	72	25.6
Pagurus pollicaris	< 10	20	3	35	19.3
Lunarca ovalis	< 10	4	3	4	3.6
Busycon contrarium	< 10	1	1	2	1.3
	10-20		2		0.6
	TOTAL	1	3	2	2.0
Squilla empusa	< 10			3	1.0
Thyone briareus	< 10			3	1.0
Libinia dubia	< 10			3	1.0
Xanthidae sp 1	< 10	2			0.6
Xanthidae sp 2	< 10	1			0.3
Summary					
Biomass (gm)		1487	1331	981	1266.3
Vertebrates					
species		12	9	7	9.3
individuals		71	38	47	52.0
Nektonic Invertebrates					
species		5	4	5	4.6
individuals		25	33	58	38.6

Table G3 (continued)

Species	Size Class (cm)	Trawl 1	2	3	$\bar{X}$
Summary (con'd)					
Benthic Macroinvertebrates					
species		6	4	7	5.6
individuals		32	10	122	54.6
Total					
species		23	17	19	19.6
individuals		128	81	227	145.3

The block: 27 spp.; 520 ind.

Table G4. Numbers of individuals of the species collected in three 5 minute trawls in block 14 on 24 July 1975.

Time on:	1200	Surface temp:	28.5	Surface sal:	-
Time off:	1240	Bottom temp:	28.0	Bottom sal:	-

Species	Size Class (cm)	Trawl 1	Trawl 2	Trawl 3	$\bar{X}$
VERTEBRATES					
Stellifer lanceolatus	< 10	15	9		8.0
	10-20	16	52		22.6
	TOTAL	31	61		30.6
Polydactylus octonemus	< 10			1	0.3
	10-20	4	22	20	15.3
	TOTAL	4	22	21	15.6
Prionotus rubio	< 10	5	2	17	8.0
	10-20	4	2	2	2.6
	TOTAL	9	4	19	10.6
Micropogon undulatus	10-20	7	7	7	7.0
Symphurus civitatus	< 10	4	1	2	2.3
	10-20	4	2	1	2.3
	TOTAL	8	3	3	4.6
Chaetodipterus faber	< 10	6	3	4	4.3
Cynoscion arenarius	< 10	1	1	1	1.0
	10-20		2		0.6
	TOTAL	1	3	1	1.6
Trichiurus lepturus	20-30		2		0.6
	30-40	1			0.3
	TOTAL	1	2		1.0
Citharichthys spilopterus	10-20	1		1	0.6
Arius felis	10-20	1			0.3
NEKTONIC INVERTEBRATES					
Callinectes similis	< 10	28	32	9	23.0
Penaeus aztecus	< 10	7	3	2	4.0
	10-20	19	6	5	10.0
	TOTAL	26	9	7	14.0
Penaeus setiferus	< 10	2			0.6
	10-20			3	1.0
	TOTAL	2		3	1.6

Table G4 (continued)

Species	Size Class (cm)	Trawl 1	Trawl 2	Trawl 3	$\bar{X}$
NEKTONIC INVERTEBRATES (con'd)					
Callinectes sapidus	10-20		1	1	0.6
Loliguncula brevis	< 10	1			0.3
BENTHIC MACROINVERTEBRATES					
Lunarca ovalis	< 10	14	14	7	11.6
Pagurus pollicaris	< 10	7	14	5	8.6
Cantharus cancellarius	< 10			5	1.6
Persephona crinata	< 10	2		1	1.0
Busycon spiratum	< 10	3			1.0
Busycon contrarium	< 10	1		1	0.6
Molgula manhattensis	< 10	1			0.3
Terebra protexta	< 10			1	0.3
Summary					
Biomass (gm)		1419	1788	1463	1556.6
Veretebrates					
species		10	8	7	8.3
individuals		69	105	56	76.6
Nektonic Invertebrates					
species		4	3	4	3.6
individuals		57	42	20	39.6
Benthic Macroinvertebrates					
species		6	2	6	4.6
individuals		28	28	20	25.3
Total					
species		20	13	17	16.6
individuals		154	175	96	141.6

The block: 23 spp.; 425 ind.

Table G5. Numbers of individuals of the species collected in three 5 minute trawls in block 27 on 24 July 1975.

Time on: 1340 Surface temp: 28.5 Surface sal: -
Time off: 1455 Bottom temp: 28.0 Bottom sal: -

Species	Size Class (cm)	Trawl 1	Trawl 2	Trawl 3	$\bar{X}$
VERTEBRATES					
Polydactylus octonemus	10-20		10	5	5.0
Symphurus civitatus	< 10		2	1	1.0
	10-20	1	2	4	2.3
	TOTAL	1	4	5	3.3
Prionotus rubio	< 10		3		1.0
	10-20		3	2	1.6
	TOTAL		6	2	2.6
Chaetodipterus faber	< 10		6	1	2.3
Micropogon undulatus	10-20		2	2	1.3
Citharichthys spilopterus	< 10		2	1	1.0
Chloroscombrus chrysurus	10-20		2		0.6
Cynoscion arenarius	10-20		2		0.6
Trichiurus lepturus	20-30	1			0.3
	30-40		1		0.3
	TOTAL	1	1		0.6
Arius felis	20-30		1		0.3
Sphaeroides parvus	< 10		1		0.3
Stellifer lanceolatus	10-20		1		0.3
NEKTONIC INVERTEBRATES					
Penaeus aztecus	10-20		23	7	10.0
Callinectes similis	< 10	6	11	12	9.6
Penaeus setiferus	< 10		2		0.6
	10-20	1	2		1.0
	TOTAL	1	4		1.6
Sicyonia dorsalis	< 10		1		0.3

Table G5 (continued)

Species	Size Class (cm)	Trawl 1	2	3	$\bar{X}$
<u>BENTHIC MACROINVERTEBRATES</u>					
Pagurus pollicaris	< 10	1	20	5	8.6
Anadara transversa	< 10	2	5		2.3
Lunarca ovalis	< 10			6	2.0
Thyone briareus	< 10	2		1	1.0
Busycon spiratum	< 10		1	1	0.6
Persephona crinata	< 10		2		0.6
Polinices duplicatus	< 10	1	1		0.6
Squilla empusa	< 10		2		0.6
Libinia dubia	< 10	1	1		0.6
Gastropoda, unID	< 10		1		0.3
Summary					
Biomass (gm)		128	836	292	418.6
Vertebrates					
species		2	12	6	6.6
individuals		2	38	16	18.6
Nektonic Invertebrates					
species		2	4	2	2.6
individuals		7	39	19	21.6
Benthic Invertebrates					
species		5	8	4	5.6
individuals		7	33	13	17.6
Total					
species		9	24	12	15.0
individuals		16	110	48	58.0

The block: 26 spp.; 174 ind.

Table G6. Numbers of individuals of the species collected in three 5 minute trawls in block 2 on 19 September 1975.

Time on: 1600 Surface temp: 28.0 Surface sal: 25.0
Time off: 1645 Bottom temp: 28.0 Bottom sal: 29.0

Species	Size Class (cm)	Trawl 1	Trawl 2	Trawl 3	$\bar{X}$
VERTEBRATES					
Chloroscombrus chrysurus	5-10	3	5	1	3.0
	10-15	2		2	1.3
	TOTAL	5	5	3	4.3
Symphurus civitatus	10-15	1			0.3
NEKTONIC INVERTEBRATES					
Beroe ovata	< 5	2	9	4	5.0
Trachypeneus similis	< 5	5			1.6
	5-10	8			2.6
	TOTAL	13			4.3
Penaeus aztecus	5-10	5			1.6
	10-15	5		1	2.0
	TOTAL	10		1	3.6
Cubomedusa, unID			1	4	1.6
Loliguncula brevis	< 5		1	1	0.6
	5-10		2	1	1.0
	TOTAL		3	2	1.6
Callinectes similis	< 5	3			1.0
Penaeus setiferus	5-10	1			0.3
	10-15	1			0.3
	TOTAL	2			0.6
BENTHIC MACROINVERTEBRATES					
Squilla empusa	5-10	11			3.6
Persephona crinata	< 5	3			1.0
Pagurus pollicaris	< 5	2			0.6
Busycon contrarium	< 5	1			0.3

Table G6 (continued)

Species	Size Class (cm)	Trawl 1	2	3	$\bar{X}$
Summary					
Biomass (gm)		321	43	102	155.3
Vertebrates					
species		2	1	1	1.3
individuals		6	5	3	4.6
Nektonic Invertebrates					
species		5	3	4	4.0
individuals		30	13	11	18.0
Benthic Macroinvertebrates					
species		3			1.0
individuals		17			5.6
Total					
species		10	4	5	6.3
individuals		53	18	14	28.3

The block: 13 spp.; 85 ind.

Table G7. Numbers of individuals of the species collected in three 5 minute trawls in block 15 on 18 September 1975.

Time on:	1330	Surface temp:	28.0	Surface sal:	24.0
Time off:	1415	Bottom temp:	28.0	Bottom sal:	29.0

Species	Size Class (cm)	Trawl 1	Trawl 2	Trawl 3	$\bar{X}$
VERTEBRATES					
Stellifer lanceolatus	< 5		14		4.6
	5-10		7		2.3
	10-15		6		2.0
	TOTAL		27		9.0
Chloroscombrus chrysurus	5-10	15	1		5.3
	10-15			2	0.6
	TOTAL	15	1	2	6.0
Micropogon undulatus	10-15	1	1	8	3.3
	15-20	3		1	1.3
	TOTAL	4	1	9	4.6
Chaetodipterus faber	< 5	2	2		1.3
	5-10		1		0.3
	TOTAL	2	3		1.6
Polydactylus octonemus	10-15		2		0.6
Symphurus civitatus	5-10		1	1	0.6
Anchoa mitchilli	< 5			2	0.6
Cynoscion nothus	5-10		1		0.3
Vomer setapinnis	5-10	1			0.3
NEKTONIC INVERTEBRATES					
Chiropsalmus quadrumanus		29	97	17	47.6
Xiphopeneus krøyeri	5-10	5	17	1	7.6
	10-15		1		0.3
	TOTAL	5	18	1	8.0
Callinectes similis	< 5	7	7	3	5.6
Penaeus setiferus	5-10		1	5	2.0
	10-15	2		2	1.3
	15-20			3	1.0
	TOTAL	2	1	10	4.3

Table G7 (continued)

NEKTONIC INVERTEBRATES (con'd)					
Penaeus aztecus	< 5-10	6	3		3.0
	10-15		1		0.3
	TOTAL	6	4		3.3
Beroe ovata		1		5	2.0
Persephona crinata	< 5	2	2	1	1.6
Trachypeneus similis	< 5		2	3	1.6
Sicyonia dorsalis	< 5	1	1		0.6
BENTHIC MACROINVERTEBRATES					
Pagurus pollicaris	< 5		3	1	1.3
Lunarca ovalis	< 5	1	1	2	1.3
Anadara brasiliana	< 5	1		1	0.6
Busycon contrarium	< 5	2			0.6
Libinia dubia	< 5		2		0.6
Hepatus epheliticus	5-10	1			0.3
Hepatus pudibundus	< 5	1			0.3
Squilla empusa		1			0.3
Summary					
Biomass (gm)		278	886	226	463.3
Vertebrates					
species		4	7	4	5.0
individuals		22	36	14	24.0
Nektonic Invertebrates					
species		8	8	7	7.6
individuals		53	132	40	75.0
Benthic Macroinvertebrates					
species		6	3	3	4.0
individuals		7	6	4	5.6

Table G7 (continued)

Species	Size Class (cm)	Trawl 1	2	3	$\bar{X}$
Summary (con'd)					
Total					
species		18	18	14	16.6
individuals		82	174	58	104.6

The block: 26 spp.; 314 ind.

Table G8. Numbers of individuals of the species collected in three 5 minute trawls in block 12 on 18 September 1975.

Time on:	1645	Surface temp:	28.5	Surface sal:	25.0
Time off:	1715	Bottom temp:	28.0	Bottom sal:	30.0

Species	Size Class (cm)	Trawl 1	Trawl 2	Trawl 3	$\bar{x}$
<u>VERTEBRATES</u>					
Leiostomus xanthurus	10-15	1			0.3
	15-20	1	1		0.6
	TOTAL	2	1		1.0
Prionotus rubio	10-15		1		0.3
Symphurus civitatus	5-10			1	0.3
Porichthys porosissimus	10-15			1	0.3
<u>NEKTONIC INVERTEBRATES</u>					
Beroe ovata		3	1	8	4.0
Penaeus aztecus	5-10			2	0.6
	10-15			6	2.0
	TOTAL			8	2.6
Loliguncula brevis	< 5	2		1	1.0
Cubomedusa, unID	< 5	3			1.0
Trachypeneus similis	< 5		1		0.3
	5-10			1	0.3
	TOTAL		1	1	0.6
Penaeus setiferus	5-10		1		0.3
	10-15			1	0.3
	TOTAL		1	1	0.6
Callinectes similis	< 5			2	0.6
<u>BENTHIC MACROINVERTEBRATES</u>					
Squilla empusa	5-10			4	1.6
Busycon spiratum	< 5			1	0.3
	5-10			1	0.3
	TOTAL			2	0.6
Cantharus cancellarius	< 5			1	0.3

Table G8 (continued)

Species	Size Class (cm)	Trawl 1	2	3	$\bar{X}$
Summary					
Biomass (gm)		92	72	166	110.0
Vertebrates					
species		1	2	2	1.6
individuals		2	2	2	2.0
Nektonic Invertebrates					
species		3	3	6	4.0
individuals		8	3	21	10.6
Benthic Macroinvertebrates					
species				3	1.0
individuals				7	2.3
Total					
species		4	5	11	6.6
individuals		10	5	30	15.0

The block: 14 spp.; 45 ind.

Table G9. Numbers of individuals of the species collected in three 5 minute trawls in block 14 on 18 September 1975.

Time on:	1725	Surface temp:	28.5	Surface sal:	26.0
Time off:	1805	Bottom temp:	28.0	Bottom sal:	31.0

Species	Size Class (cm)	Trawl 1	2	3	$\bar{X}$
VERTEBRATES					
Micropogon undulatus	10-15		6		2.0
	15-20		6		2.0
	TOTAL		12		4.0
Polydactylus octonemus	10-15	1		2	1.0
	15-20	2	3	2	2.3
	TOTAL	3	3	4	3.3
Chloroscombrus chrysurus	5-10		1		0.3
	10-15		2	1	1.0
	15-20			1	0.3
	TOTAL		3	2	1.6
Prionotus rubio	5-10			1	0.3
	10-15		1		0.3
	TOTAL		1	1	0.6
Cynoscion nothus	15-20			2	0.6
Arius felis	15-20		1		0.3
	25-30	1			0.3
	TOTAL	1	1		0.6
Menticirrhus americanus	15-20		1		0.3
Chaetodipterus faber	5-10		1		0.3
Syacium gunteri	10-15		1		0.3
Trichiurus lepturus	5-10			1	0.3
Citharichthys spilopterus	10-15			1	0.3
NEKTONIC INVERTEBRATES					
Loliguncula brevis	< 5	2	2	2	2.0
Cubomedusa, unID	< 5	1	5		2.0
Beroe ovata	< 5		4	1	1.6
Callinectes similis	< 5		1		0.3

Table G9 (continued)

Species	Size Class (cm)	Trawl 1	2	3	$\bar{X}$
NEKTONIC INVERTEBRATES (con'd)					
Penaeus aztecus	5-10		1		0.3
Trachypeneus similis	< 5			1	0.3
Portunus gibbesi	5-10			1	0.3
BENTHIC MACROINVERTEBRATES					
Cantharus cancellarius	< 5			3	1.0
Lunarca ovalis	< 5			1	0.3
Metoporhaphis calcarata	< 5			1	0.3
Summary					
Biomass (gm)		306	441	49	265.3
Vertebrates					
species		2	8	6	5.3
individuals		4	20	11	11.6
Nektonic Invertebrates					
species		2	5	4	3.6
individuals		3	13	5	7.0
Benthic Macroinvertebrates					
species				3	1.0
individuals				5	1.6
Total					
species		4	13	13	10.0
individuals		7	33	21	20.3

The block: 21 spp.; 61 ind.

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6.

Table G10. Numbers of individuals of the species collected in three 5 minute trawls in block 27 on 17 September 1975.

Time on:	1702	Surface temp:	28.0	Surface sal:	29.0
Time off:	1739	Bottom temp:	28.0	Bottom sal:	32.0

Species	Size Class (cm)	Trawl 1	2	3	$\bar{X}$
VERTEBRATES					
Symphurus civitatus	5-10	2	2		1.3
	10-15			2	0.6
	TOTAL	2	2	2	2.0
Citharichthys spilopterus	10-15		1	1	0.6
NEKTONIC INVERTEBRATES					
Trachypeneus similis	< 5		5		1.6
	5-10	6	4	2	4.0
	TOTAL	6	9	2	5.6
Penaeus aztecus	5-10		5		1.6
	10-15	2		1	1.0
	TOTAL	2	5	1	2.6
Callinectes similis	< 5	1	3		1.3
Sicyonia dorsalis	< 5	1	1		0.6
Beroe ovata				2	0.6
Penaeus setiferus	10-15	1			0.3
Scyphozoa, unID			1		0.3
Loliguncula brevis	< 5			1	0.3
BENTHIC MACROINVERTEBRATES					
Pagurus pollicaris	< 5	1	2		1.0
Squilla empusa	5-10	1	1		0.6
Persephona crinata	< 5			2	0.6
Polinices duplicatus	< 5		1		0.3
Unknown gastropod	< 5			1	0.3
Summary					
Biomass (gm)		71	95	66	77.3

Table G10 (continued)

Species	Size Class (cm)	Trawl 1	2	3	$\bar{X}$
Summary (con'd)					
Vertebrates					
species		1	2	2	1.6
individuals		2	3	3	2.6
Nektonic Invertebrates					
species		5	5	4	4.6
individuals		11	19	6	12.0
Benthic Macroinvertebrates					
species		2	3	2	2.3
individuals		2	4	3	3.0
Total					
species		8	10	8	8.6
individuals		17	26	12	18.3

The block: 15 spp.; 55 ind.

Table G11. Numbers of individuals of the species collected in three 5 minute trawls in block 2 on 6 December 1975.

Time on:	1200	Surface temp:	-	Surface sal:	-
Time off:	1235	Bottom temp:	-	Bottom sal:	-

Species	Size Class (cm)	Trawl 1	Trawl 2	Trawl 3	$\bar{X}$
VERTEBRATES					
Cynoscion arenarius	< 5	3			1.0
	5-10	20	9	35	21.3
	10-15	4	1	1	8.0
	TOTAL	27	10	36	24.3
Larimus fasciatus	< 5	11	12	6	9.6
	5-10	3	2	5	3.3
	TOTAL	14	14	11	13.0
Anchoa mitchilli	< 5		4		1.3
	5-10	7	4	17	9.3
	TOTAL	7	8	17	10.6
Stellifer lanceolatus	< 5	4	4	14	7.3
	5-10	2	2	4	2.6
	10-15			1	0.3
	TOTAL	6	6	19	10.3
Micropogon undulatus	< 5	3	15	7	8.3
	10-15			1	0.3
	TOTAL	3	15	8	8.6
Symphurus civitatus	5-10	0	1	2	1.3
	10-15	0	7	2	4.0
	TOTAL	0	8		5.3
Prionotus rubio	< 5		2	3	1.6
	5-10			2	0.6
	TOTAL		2	5	2.3
Menticirrhus americanus	5-10	3	2		1.6
Chaetodipterus faber	< 5		1		0.3
	5-10			1	0.3
	10-15				
	TOTAL		1	1	0.6
Peprilus burti	< 5			2	0.6
	5-10		1		0.3
	TOTAL		1	2	1.0

Table G11 Continued)

Species	Size Class (cm)	Trawl 1	Trawl 2	Trawl 3	$\bar{X}$
VERTEBRATES (con'd)					
Etropus crossotus	< 5	1			0.3
	5-10		1		0.3
	TOTAL	1	1		0.6
Sphaeroides parvus	< 5			1	0.3
Menidia beryllina	5-10			1	0.3
Arius felis	5-10			1	0.3
Gnathagnus egregius	< 5			1	0.3
NEKTONIC INVERTEBRATES					
Trachypeneus similis	< 5	26	69	31	42.0
	5-10	2	13	28	14.3
	TOTAL	28	82	59	56.3
Callinectes similis	< 5	45	40	72	52.3
Penaeus setiferus	5-10	3	5	3	3.6
	10-15	16	11	22	16.3
	TOTAL	19	16	25	20.0
Sicyonia dorsalis	< 5	3	18	17	12.6
Portunus gibbesii	< 5	14	1	4	6.3
Xiphopeneus krøyeri	5-10	1			0.3
Loliguncula brevis	5-10		1		0.3
BENTHIC MACROINVERTEBRATES					
Squilla empusa	< 5		1		0.3
	5-10	1			0.3
	10-15	1	1		0.6
	TOTAL	2	2		1.3
Pagurus pollicarus	< 5			1	0.3
Hepatus epheliticus	< 5			1	0.3
Polinices duplicatus	< 5			1	0.3

Table G11 (continued)

Species	Size Class (cm)	Trawl 1	Trawl 2	Trawl 3	$\bar{X}$
Summary					
Biomass (gm)		data lost	data lost	data lost	
Vertebrates					
species		8	11	13	10.7
individuals		61	69	108	79.7
Nektonic Invertebrates					
species		6	6	5	5.7
individuals		110	158	177	148.3
Benthic Macroinvertebrates					
species		1	1	3	1.7
individuals		2	2	3	2.3
Total					
species		15	18	21	18.0
individuals		173	229	288	230.0

The block: 26 spp.; 690 ind.

Table G12. Numbers of individuals of the species collected in three 5 minute trawls in block 15 on 6 December 1975.

Time on: 1545	Surface temp: -	Surface sal: -
Time off: 1610	Bottom temp: -	Bottom sal: -

Species	Size Class (cm)	Trawl 1	2	3	$\bar{X}$
VERTEBRATES					
Larimus fasciatus	< 5	48	11	23	27.3
	5-10	20	18	9	15.8
	TOTAL	68	29	32	43.0
Micropogon undulatus	< 5	80	28	4	37.3
	5-10			1	0.3
	TOTAL	80	28	5	37.6
Cynoscion arenarius	< 5	1			0.3
	5-10	16	54	8	26.0
	10-15			1	0.3
	TOTAL	17	54	9	26.6
Stellifer lanceolatus	< 5	2	3		1.6
	5-10	2	3		1.6
	TOTAL	4	6		3.3
Menticirrhus americanus	5-10	3	3		2.0
Prionotus rubio	5-10		4	1	1.6
Anchoa mitchilli	5-10	2	1		1.0
Etropus crossotus	5-10		1	1	0.6
	10-15		1		0.3
	TOTAL		2	1	1.0
Arius felis	5-10	1	1		0.6
Symphurus civitatus	5-10	1			0.3
	10-15	1			0.3
	TOTAL	2			0.6
Chaetodipterus faber	5-10	1			0.3
Astroscopus y-graecum	5-10		1		0.3
Ophidion welshi	15-20		1		0.3
Achirus lineatus	5-10		1		0.3

(1 of 2)

Table G12 (continued)

Species	Size Class	Trawl 1	2	3	$\bar{X}$
NEKTONIC INVERTEBRATES					
Trachypeneus similis	< 5	28	3	2	11.0
	5-10	9	4		4.3
	TOTAL	37	7	2	15.3
Callinectes similis	< 5	25	13		12.6
	5-10			1	0.3
	TOTAL	25	13	1	13.0
Penaeus setiferus	5-10	3	2		1.6
	10-15	7	2	4	4.3
	TOTAL	10	4	4	6.0
Portunus gibbesi	< 5	8	4	1	4.3
	5-10			1	0.3
	TOTAL	8	4	2	4.6
Sicyonia dorsalis	< 5	5			1.6
Portunus spinimanus	5-10			1	0.3
BENTHIC MACROINVERTEBRATES					
Squilla empusa	5-10	1			0.3
	10-15			1	0.3
	TOTAL	1		1	0.6
Summary					
Biomass (gm)		490.3	456	211.6	386.0
Vertebrates					
species		9	12	5	8.6
individuals		178	131	48	119.0
Nektonic Invertebrates					
species		5	4	5	4.6
individuals		85	28	10	41.0
Benthic Macroinvertebrates					
species		1		1	0.6
individuals		1		1	0.6
Total					
species		15	16	11	14.0
individuals		264	159	59	160.6

The block: 21 spp.; 482 ind.

Table G13. Numbers of individuals of the species collected in threee 5 minute trawls in block 12 on 6 December 1975.

Time on: 1300	Surface temp: -	Surface sal: -
Time off: 1335	Bottom temp: -	Bottom sal: -

Species	Size Class (cm)	Trawl 1	2	3	$\bar{X}$
VERTEBRATES					
Cynoscion arenerius	<5		2	1	1.0
	5-10	20	9	20	16.3
	10-15	2	1	2	1.6
	20-25	1			0.3
	TOTAL	23	12	23	19.3
Stellifer lanceolatus	<5	6	3	10	6.3
	5-10	4		10	4.6
	10-15	1	2	2	1.6
	TOTAL	11	5	22	12.6
Symphurus civitatus	5-10		1	2	1.0
	10-15	3	8	6	5.6
	TOTAL	3	9	8	6.6
Anchoa mitichilli	<5	1		4	1.6
	5-10	9	2	2	4.3
	TOTAL	10	2	6	6.0
Larimus fasciatus	<5	3		1	1.3
	5-10			1	0.3
	TOTAL	3		2	1.6
Micropogon undulatus	5-10	2			0.6
	10-15		1	1	0.6
	TOTAL	2	1	1	1.3
Etropus crossotus	<5		1		0.3
	5-10		1		0.3
	10-15			1	0.3
	TOTAL		2	1	1.0
Sphaeroides parvus	<5	1		1	0.6
Purichthys porosissimus	5-10		1		0.3
	10-15		1		0.3
	TOTAL		2		0.6
NEKTONIC INVERTEBRATES					
Trachypeneus similis	<5	30	32	25	29.0
	5-10	20		22	14.0
	TOTAL	50	32	47	43.0

Table G13 (continued)

Species	Size Class (cm)	Trawl 1	2	3	$\bar{X}$
<u>NEKTONIC INVERTEBRATES</u> (con'd)					
Callinectes similis	< 5	85		10	31.6
	5-10			2	0.6
	TOTAL	85		12	32.3
Sicyonia dorsalis	< 5	28		13	13.6
Penaeus setiferus	5-10	1			0.3
	10-15	20		6	8.6
	TOTAL	21		6	9.0
Portunus gibbesii	< 5	2	7	8	5.6
Loliguncula brevis	< 5			2	0.6
Chrysaosa quinquecirrha	5-10	1	1		0.6
<u>BENTHIC MACROINVERTEBRATES</u>					
Squilla empusa	< 5		2	2	1.3
	5-10	8	3	3	4.6
	TOTAL	8	5	5	6.0
Pagurus pollicaris	< 5		3		1.0
Persephona equilonaris	< 5			1	0.3
Persephona crinata	< 5	1			0.3
Summary					
Biomass (gm)		914.8	604.3	562.1	693.8
Vertebrates					
species		8	7	8	7.7
individuals		53	33	64	50.0
Nektonic invertebrates					
species		6	3	6	5.0
individuals		187	40	88	105.0
Benthic Macroinvertebrates					
species		2	2	2	2.0
individuals		9	8	6	7.7

Table G13 (continued)

Species	Size Class (cm)	Trawl 1	2	3	$\bar{X}$
Summary (con'd)					
Total					
species		16	12	16	14.7
individuals		249	81	158	162.8

The block: 20 spp.; 488 ind.

Table G14. Numbers of individuals of the specis collected in three 5 minute trawls in block 14 on 6 December 1975.

Time on: 1400 Surface temp: - Surface sal: -
Time off: 1425 Bottom temp: - Bottom sal: -

Species	Size Class (cm)	Trawl 1	Trawl 2	Trawl 3	$\bar{X}$
VERTEBRATES					
Anchoa mitchilli	<5	2		1	1.0
	5-10	12	6	22	13.3
	TOTAL	14	6	23	14.3
Cynoscion arenarius	5-10	2	5	1	2.6
Symphurus civitatus	5-10		2		0.6
	10-15	1	4	1	2.0
	TOTAL	1	6	1	2.6
Sphaeroides parvus	<5	3	1	1	1.6
Chaetodipterus faber	5-10		1		0.3
	10-15	1	1		0.6
	TOTAL	1	2		1.0
Etropus crossotus	<5		1		0.3
	5-10		1		0.3
	TOTAL		2		0.6
Porichthys porosissimus	5-10	1			0.3
Micropogon undulatus	10-15		1		0.3
Stellifer lanceolatus	10-15		1		0.3
Larimus fasciatus	<5		1		0.3
Centropristis philadelphica	10-15		1		0.3
Orthopristis chrysoptera	10-15		1		0.3
NEKTONIC INVERTEBRATES					
Trachypeneus similis	<5	19	5	1	8.3
	5-10	5	9		4.6
	TOTAL	24	14	1	13.0
Callinectes similis	<5	20	4		8.0
Sicyonia dorsalis	<5	6	4	2	4.0

Table G14 (continued)

Species	Size Class (cm)	Trawl 1	2	3	$\bar{X}$
<u>NEKTONIC INVERTEBRATES</u> (con'd)					
Loliguncula brevis	< 5		1	3	1.3
	5-10	1	2	3	2.0
	TOTAL	1	3	6	3.3
Penaeus setiferus	10-15	3	3	1	2.3
Portunus gibbesi	< 5	1	4		1.6
<u>BENTHIC MACROINVERTEBRATES</u>					
Squilla empusa	< 5		1		0.3
Summary					
Biomass (gm)		178.0	397.1	141.0	238.7
Vertebrates					
species		6	11	4	7.0
individuals		22	27	26	
Nektonic Invertebrates					
species		6	6	4	5.3
individuals		55	32	10	
Benthic Macroinvertebrates					
species			1		0.3
individuals			1		0.3
Total					
species		12	18	8	12.7
individuals		77	60	36	57.7

The block: 19 spp.; 173 ind.

Table G15. Numbers of individuals of the species collected in three 5 minute trawls in block 27 on 6 December 1975.

Time on: 1500 Surface temp: - Surface sal: -
Time off: 1525 Bottom temp: - Bottom sal: -

Species	Size Class (cm)	Trawl 1	Trawl 2	Trawl 3	X̄
<u>VERTEBRATES</u>					
Cynoscion arenarius	5-10	1	5	19	8.3
	10-15		1	1	0.6
	TOTAL	1	6	20	9.0
Peprilus burti	< 5		6		2.0
Anchoa mitchelli	5-10	1	2	2	1.6
Symphurus civitatus	10-15	2		3	1.6
Stellifer lanceolatus	< 5			3	1.0
	5-10			1	0.3
	TOTAL			4	1.3
Larimus fasciatus	< 5			1	0.3
	5-10			2	0.6
	TOTAL			3	1.0
Micropogon undulatus	10-15		2	1	1.0
Sphaeoides parvus	< 5		1	1	0.6
	5-10		1		0.3
	TOTAL		2	1	1.0
Etropus crossotus	10-15		1	1	0.6
Chaetodipterus faber	5-10	1			0.3
	10-15		1		0.3
	TOTAL	1	1		0.6
Trichiurus lepturus	25-30		1		0.3
Caranx bartholomaei	5-10		1		0.3
Centropristis philadelphica	5-10			1	0.3
Prionotus rubio	5-10			1	0.3
<u>NEKTONIC INVERTEBRATES</u>					
Trachypeneus similis	< 5	17	13	38	22.7
	5-10	13	11	31	18.3
	TOTAL	30	24	69	41.0

Table G15 (continued)

Species	Size Class (cm)	Trawl 1	2	3	$\bar{X}$
NEKTONIC INVERTEBRATES (con'd)					
Callinectes similis	< 5	4	33	42	26.3
	5-10			2	0.7
	TOTAL	4	33	44	27.0
Sicyonia dorsalis	< 5	8	19	38	21.7
Portunus gibbesii	< 5		7	10	5.7
Penaeus setiferus	10-15	1	1	12	4.7
Poninices duplicatus	< 5			1	0.3
Unknown Scyphozoan	10-15		1		0.3
BENTHIC MACROINVERTEBRATES					
Squilla empusa	5-10		1	6	2.3
	10-15			1	0.3
	TOTAL		1	7	2.6
Pagurus pollicaris	< 5			1	0.3
Hepatus ephelicticus	< 5			1	0.3
Summary					
Biomass (gm)		105	293.4	606.6	335.0
Vertebrates					
species		4	9	10	7.7
individuals		5	22	37	21.3
Nektonic Invertebrates					
species		4	6	6	5.3
individuals		43	85	174	100.7
Benthic Macroinvertebrates					
species			1	3	1.3
individuals			1	9	3.3
Total					
species		8	16	19	14.3
individuals		48	108	220	125.3

The block: 24 spp.; 376 ind.

Table G16. Numbers of individuals of the species collected in three 5 minute trawls in block 2 on 20 January 1976.

Time on:	0820	Surface temp: 12.5	Surface sal: 26.0
Time off:	0844	Bottom temp: 12.0	Bottom sal: 28.0

Species	Size Class (cm)	Trawl 1	Trawl 2	Trawl 3	$\bar{X}$
VERTEBRATES					
Micropogon undulatus	< 5	5	19	21	15.0
Anchoa mitchilli	< 5		2	4	2.0
	5-10	10	2	17	9.6
	TOTAL	10	4	21	11.6
Symphurus civitatus	10-15	2	2		1.3
Peprilus burti	5-10	1		1	0.6
Leiostomus xanthurus	15-20	1			0.3
Prionotus rubio	5-10		1		0.3
Larimus fasciatus	< 5			1	0.3
Menticirrhus americanus	10-15			1	0.3
Urophycis cirratus	5-10			1	0.3
NEKTONIC INVERTEBRATES					
Trachypeneus similis	< 5		9		3.0
	5-10	5	20	4	9.6
	TOTAL	5	29	4	12.6
Penaeus setiferus	5-10	8	9	12	9.6
	10-15		2	1	1.0
	TOTAL	8	11	13	10.6
Callinectes similis	< 5	1	4	3	2.6
Xiphopeneus krøyeri	5-10	1	2	4	2.3
	10-15			1	0.3
	TOTAL	1	2	5	2.6
Sicyonia dorsalis	< 5	2	3	2	2.6
BENTHIC MACROINVERTEBRATES					
Speocarcinus lobatus	< 5	1			0.3
Aegathoa oculata	< 5	1			0.3

Table G16 (continued)

Species	Size Class (cm)	Trawl 1	Trawl 2	Trawl 3	$\bar{x}$
BENTHIC MACROINVERTEBRATES (con'd)					
Squilla empusa	5-10		1		0.3
Lunarca ovalis	< 5		1		0.3
Polinices duplicatus	< 5		1		0.3
Thyone briareus	< 5		1		0.3
Libinia dubia	< 5			1	0.3
Metoporhapis calcarata	< 5			1	0.3
Summary					
Biomass (gm)		150	163	136	149.7
Vertebrates					
species		5	4	6	5.0
individuals		19	26	46	30.3
Nektonic Invertebrates					
species		5	5	5	5.0
individuals		17	49	27	31.0
Benthic Macroinvertebrates					
species		2	4	2	2.6
individuals		2	4	2	2.6
Total					
species		12	13	13	12.6
individuals		38	79	75	64.0

The block: 22 spp.; 193 ind.

Table G17. Numbers of individuals of the species collected in three 5 minute trawls in block 15 on 20 January 1976.

Time on:	1138	Surface temp:	12.0	Surface sal:	25.0
Time off:	1202	Bottom temp:	12.0	Bottom sal:	25.0

Species	Size Class (cm)	Trawl 1	2	3	$\bar{X}$
VERTEBRATES					
Anchoa mitchilli	< 5	3	34	15	17.3
	5-10	1	10	5	5.3
	TOTAL	4	44	20	22.6
Micropogon undulatus	< 5	16	20	29	21.6
	5-10		1	1	0.6
	TOTAL	16	21	30	22.3
Larimus fasciatus	< 5		3		1.0
	5-10		1	1	0.6
	TOTAL		4	1	1.6
Symphurus civitatus	10-15		1	3	1.3
Etropus crossotus	< 5	1			0.3
	5-10	1			0.3
	TOTAL	2			0.6
Prionotus rubio	5-10	1			0.3
Sphaeroides parvus	5-10	1			0.3
Cynoscion arenarius	5-10		1		0.3
Leiostomus xanthurus	10-15		1		0.3
Peprilus burti	< 5		1		0.3
Achirus lineatus	< 5		1		0.3
Menticirrhus americanus	5-10			1	0.3
NEKTONIC INVERTEBRATES					
Trachypeneus similis	< 5	23	7	18	16.0
	5-10	7	4	2	4.3
	TOTAL	30	11	20	20.3
Penaeus setiferus	5-10			5	1.6
	10-15	7	3	1	3.0
	TOTAL	7	3	6	5.3
Sicyonia dorsalis	< 5	4		4	2.6

Table G17 (continued)

Species	Size Class (cm)	Trawl 1	2	3	$\bar{X}$
NEKTONIC INVERTEBRATES					
Xiphopeneus krøyeri	5-10		4	4	2.6
Portunus gibbesii	< 5	3		3	2.0
Callinectes similis	< 5		1	2	1.0
Summary					
Biomass (gm)		95.0	141.0	155.0	130.3
Vertebrates					
species		5	8	5	6.0
individuals		24	74	55	51.0
Nektonic Invertebrates					
species		4	4	6	4.7
individuals		44	19	39	34.0
Benthic Macroinvertebrates					
species					
individuals					
Total					
species		9	12	11	10.7
individuals		68	93	94	85.0

The block: 18 spp.; 255 ind.

Table G18. Numbers of individuals of the species collected in three 5 minute trawls in block 12 on 20 January 1976.

Time on:	0911	Surface temp:	12.0	Surface sal:	25.0
Time off:	0940	Bottom temp:	12.0	Bottom sal:	26.0

Species	Size Class (cm)	Trawl 1	Trawl 2	Trawl 3	$\bar{X}$
VERTEBRATES					
Micropogon undulatus	< 5	128	133	79	113.3
	5-10	3	2	1	2.0
	TOTAL	131	135	80	115.3
Symphurus civitatus	5-10			4	1.3
	10-15	10	4	11	8.3
	TOTAL	10	4	15	9.6
Larimus fasciatus	< 5	1		1	0.6
	5-10	13	4	2	6.3
	TOTAL	14	4	3	7.0
Leiostomus xanthurus	10-15	1	4		1.6
	15-20		9		3.0
	TOTAL	1	13		4.6
Prionotus rubio	< 5		2		0.6
	5-10		1	2	1.0
	TOTAL		3	2	1.6
Anchoa mitchilli	5-10		4		1.3
Chaetodipterus faber	5-10	1	1		0.6
Etropus crossotus	< 5		1		0.3
	5-10			1	0.3
	TOTAL		1	1	0.6
Cynoscion arenarius	5-10	1			0.3
Trichiurus lepturus	40-50		1		0.3
Peprilus burti	5-10		1		0.3
Orthopristis chrysoptera	15-20		1		0.3
Bairdiella chrysura	10-15		1		0.3
Citharichthys spilopterus	5-10			1	0.3
Urophycis floridanus	10-15			1	0.3

Table G18 (continued)

Species	Size Class (cm)	Trawl 1	2	3	$\bar{X}$
NEKTONIC INVERTEBRATES					
Trachypeneus similis	< 5	22	5	25	17.3
	5-10	1	7	18	8.7
	10-15			1	0.3
	TOTAL	23	12	44	26.3
Sicyonia dorsalis	< 5	32	8	7	12.6
Penaeus setiferus	5-10	2	4	3	3.0
	10-15	2	4	4	3.3
	TOTAL	4	8	7	6.3
Callinectes similis	< 5	12	5	2	6.3
Xiphopeneus krøyeri	5-10	1		4	1.6
Portunus gibbesii	< 5			1	0.3
BENTHIC MACROINVERTEBRATES					
Squilla empusa	< 5	12			4.0
	5-10		1		0.3
	10-15		1		0.3
	TOTAL	12	2		4.6
Polinices duplicatus	< 5			2	0.6
Calliactis tricolor	< 5			1	0.3
Summary					
Biomass (gm)		366.5	1018.5	424.2	603.1
Vertebrates					
species		6	12	7	8.3
individuals		158	169	103	143.3
Nektonic Invertebrates					
species		5	4	6	5.0
individuals		72	33	65	56.6
Benthic Macroinvertebrates					
species		1	1	2	1.3
individuals		12	2	3	5.6

Table G18 (continued)

Species	Size Class (cm)	Trawl 1	Trawl 2	Trawl 3	$\bar{X}$
Summary (con'd)					
Total					
species		12	18	15	14.6
individuals		242	204	171	205.6

The block: 24 spp.; 617 ind.

Table G19. Numbers of individuals of the species collected in three 5 minute trawls in block 14 on 20 January 1976.

Time on: 0958 Surface temp: 12.0 Surface sal: 25.0
Time off: 1020 Bottom temp: 12.0 Bottom sal: 26.0

Species	Size Class (cm)	Trawl 1	Trawl 2	Trawl 3	$\bar{X}$
VERTEBRATES					
Micropogon undulatus	< 5	23	1	1	8.3
	10-15			1	0.3
	TOTAL	23	1	2	8.6
Larimus fasciatus	< 5	13	4	5	7.3
	5-10	2		2	1.3
	TOTAL	15	4	7	8.6
Symphurus civitatus	< 5	1			0.3
	5-10	6			2.0
	10-15			3	1.0
	TOTAL	7		3	3.3
Cynoscion arenarius	5-10	5			1.6
Citharichthys spilopterus	5-10		1		0.3
	10-15		4		1.3
	TOTAL		5		1.6
Etropus crossotus	5-10	2			0.6
Prionotus rubio	< 5	1			0.3
Leiostomus xanthurus	10-15		1		0.3
Sphaeroides parvus	5-10			1	0.3
NEKTONIC INVERTEBRATES					
Trachypeneus similis	< 5	33	21	5	19.6
	5-10	14	9	2	8.3
	TOTAL	47	30	7	28.0
Sicyonia dorsalis	< 5	20	6	3	9.6
	5-10	2			0.6
	TOTAL	22	6	3	10.3
Penaeus setiferus	10-15	4	3		2.3
Callinectes similis	< 5	3	2	1	2.0
Portunus gibbesii	< 5			2	0.6

Table G19 (continued)

Species	Size Class (cm)	Trawl 1	2	3	$\bar{X}$
BENTHIC MACROINVERTEBRATES					
Calliactis tricolor	< 5	4			1.3
Squilla empusa	< 5	1			0.3
	5-10	1	1		0.7
	TOTAL	2	1		1.0
Pagurus pollicaris	< 5	2			0.6
Hemipholis elongata	5-10		1		0.3
Xanthidae, unID	< 5	1			0.3
Summary					
Biomass (gm)		378.3	199.4	116.0	231.2
Vertebrates					
species		6	4	4	6.3
individuals		53	11	13	25.7
Nektonic Invertebrates					
species		4	4	4	4.0
individuals		76	41	13	43.3
Benthic Macroinvertebrates					
species		4	2		2.0
individuals		9	2		3.7
Total					
species		14	10	8	10.7
individuals		138	54	26	72.7

The block: 19 spp.; 218 ind.

Table G20. Numbers of individuals of the species collected in three 5 minute trawls in block 27 on 20 January 1976.

Time on:	1042	Surface temp:	12.0	Surface sal:	25.0
Time off:	1107	Bottom temp:	12.0	Bottom sal:	26.0

Species	Size Class (cm)	Trawl 1	2	3	$\bar{X}$
VERTEBRATES					
Micropogon undulatus	< 5	69	247	152	156.0
	5-10	2	4	7	4.3
	20-30	1			0.3
	TOTAL	72	251	159	160.6
Symphurus civitatus	< 5		1		0.3
	5-10		8	1	3.0
	10-15	8		7	5.0
	TOTAL	8	9	8	8.3
Cynoscion arenarius	5-10		5		1.6
	20-25	1			0.3
	TOTAL	1	5		2.0
Larimus fasciatus	< 5	2		1	1.0
Chaetodipterus faber	5-10		1		0.3
Urophycis floridanus	5-10		1		0.3
Etropus crossotus	< 5		1		0.3
Leiostomus xanthurus	10-15			1	0.3
Stellifer lanceolatus	10-15			1	0.3
Sphaeroides parvus	5-10			1	0.3
NEKTONIC INVERTEBRATES					
Sicyonia dorsalis	< 5	25	46	60	40.3
Trachypeneus dimilis	< 5	15		55	23.3
	5-10	12		20	10.6
	TOTAL	27		75	34.0
Callinectes similis	< 5	1	6	8	3.0
Penaeus setiferus	10-15	3	3	9	5.0
Portunus gibbesii	< 5			1	0.3
	5-10	1			0.3
	TOTAL	1		1	0.6

Table G20 (continued)

Species	Size Class (cm)	Trawl 1	2	3	$\bar{X}$
NEKTONIC INVERTEBRATES (con'd)					
Penaeus aztecus	5-10		1		0.3
Xiphopeneus krøyeri	5-10			1	0.3
BENTHIC MACROINVERTEBRATES					
Squilla empusa					
	5-10	1	1	1	1.0
	TOTAL	1	1	1	1.0
Summary					
Biomass (gm)		418.3	435.9	614.8	489.6
Vertebrates					
species		4	6	6	5.3
individuals		83	268	171	174.0
Nektonic Invertebrates					
species		5	4	6	5.0
individuals		57	56	154	89.0
Benthic Macroinvertebrates					
species		1	1	1	1.0
individuals		1	1	1	1.0
Total					
species		10	11	13	11.3
individuals		141	325	326	264.0

The block: 18 spp.; 793 ind.

Table G21. Numbers of individuals of the species collected in three 5 minute trawls in block 2 on 11 March 1976.

Time on:	1220	Surface temp:	19.0	Surface sal:	26.0
Time off:	1250	Bottom temp:	19.0	Bottom sal:	27.0

Species	Size Class (cm)	Trawl 1	2	3	$\bar{X}$
VERTEBRATES					
Micropogon undulatus	< 5			14	4.6
	5-10	1	1	28	10.0
	TOTAL	1	1	42	14.6
Anchoa mitchilli	< 5	1	4	3	2.7
	5-10	17	3	2	7.3
	TOTAL	18	7	5	10.0
Cynoscion areanarius	5-10	1			0.3
	10-15			6	2.0
	TOTAL	1		6	2.3
Trichiurus lepturus	20-25	1			0.3
	25-30			3	1.0
	30-35	1			0.3
	TOTAL	2		3	1.6
Symphurus civitatus	10-15			3	1.0
Peprilus burti	5-10		1	1	0.6
Larimus fasciatus	5-10			1	0.3
NEKTONIC INVERTEBRATES					
Trachypeneus similis	< 5		4	22	8.6
	5-10	2		15	5.6
	TOTAL	2	4	37	14.3
Loliguncula brevis	< 5			1	0.3
	5-10		3	1	1.3
	TOTAL		3	2	1.6
Stomolophus meleagris	15-20	1			0.3
Callinectes similis	< 5			1	0.3
Brachyuran unID	< 5			1	0.3
BENTHIC MACROINVERTEBRATES					
Pagurus pollicaris	< 5			2	0.6

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AQUATIC DISPOSAL FIELD INVESTIGATIONS GALVESTON, TEXAS, OFFSHOR--ETC(U)
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Table G21 (continued)

Species	Size Class (cm)	Trawl 1	2	3	$\bar{X}$
BENTHIC MACROINVERTEBRATES (con'd)					
Hepatus pudibundus	< 5			1	0.3
Squilla empusa	5-10			1	0.3
Calliactis tricolor	< 5			1	0.3
Summary					
Biomass (gm)		585	86	335	335.3
Vertebrates					
species		4	3	8	4.6
individuals		22	9	61	30.6
Nektonic Invertebrates					
species		2	2	4	2.6
individuals		3	7	41	17.0
Benthic Macroinvertebrates					
species				4	1.3
individuals				5	1.6
Total					
species		6	5	16	9.0
individuals		25	16	107	49.3

The block: 16 spp.; 147 ind.

Table G22. Numbers of individuals of the species collected in three 5 minute trawls in block 15 on 11 March 1976.

Time on: 1545 Surface temp: 19.0 Surface sal: 26.0
Time off: 1615 Bottom temp: 19.0 Bottom sal: 27.0

Species	Size Class (cm)	Trawl 1	Trawl 2	Trawl 3	$\bar{X}$
VERTEBRATES					
Micropogon undulatus	< 5	17	25		14.0
	5-10	152	110	11	91.0
	TOTAL	169	135	11	105.0
Larimus fasciatus	< 5		1		0.3
	5-10		14		4.6
	TOTAL		15		5.0
Cynoscion arenarius	5-10		10		3.3
Anchoa mitchilli	< 5			4	1.3
	5-10	4			1.3
	TOTAL	4		4	2.6
Trichiurus lepturus	20-25	1			0.3
	25-30	1			0.3
	30-35		1		0.3
	TOTAL	2	1		1.0
Etropus crossotus	< 5		1		0.3
	5-10		1		0.3
	TOTAL		2		0.6
Menticirrhus americanus	20-25	1			0.3
Prionotus rubio	5-10		1		0.3
NEKTONIC INVERTEBRATES					
Trachypeneus similis	< 5	7	8	12	9.0
	5-10		9	12	7.0
	TOTAL	7	17	24	16.0
Callinectes similis	< 5	1	8	6	5.0
Acetes americanus	< 5	11			2.6
Penaeus setiferus	10-15	1	1		0.6
	15-20		1	1	0.6
	TOTAL	1	2	1	1.3
Portunus gibbesi	< 5		2		0.6

Table G22 (continued)

Species	Size Class (cm)	Trawl 1	Trawl 2	Trawl 3	$\bar{X}$
NEKTONIC INVERTEBRATES (con'd)					
Sicyonia dorsalis	< 5		1		0.3
Ovalipes ocellatus	< 5		1		0.3
Scyphozoa unID	5-10		1		0.3
BENTHIC MACROINVERTEBRATES					
Hepatus epheliticus	< 5	1			0.3
Panopeus herbstii	< 5			1	0.3
Summary					
Biomass (gm)		817	790.7	150.9	586.2
Vertebrates					
species		4	6	2	4.0
individuals		176	164	15	118.3
Nektonic Invertebrates					
species		4	7	3	4.6
individuals		20	32	31	27.6
Benthic Macroinvertebrates					
species		1		1	0.6
individuals		1		1	0.6
Total					
species		9	13	6	9.3
individuals		197	196	47	146.6

The block: 18 spp.; 440 ind.

Table G23. Numbers of individuals of the species collected in three 5 minute trawls in block 12 on 11 March 1976.

Time on:	1340	Surface temp:	19.0	Surface sal:	25.0
Time off:	1405	Bottom temp:	19.0	Bottom sal:	27.0

Species	Size Class (cm)	Trawl 1	2	3	$\bar{X}$
VERTEBRATES					
Anchoa mitchilli	< 5		4		1.3
	5-10	1	21	6	9.3
	TOTAL	1	25	6	10.6
Micropogon undulatus	< 5	2		2	1.3
	5-10	4		1	1.6
	TOTAL	6		3	3.0
Cynoscion arenarius	5-10	5		1	2.0
	10-15	1			0.3
	TOTAL	6		1	2.3
Symphurus civitatus	5-10		1		0.3
	10-15	2			0.6
	TOTAL	2	1		1.0
Larimus fasciatus	5-10	1			0.3
Leiostomus xanthurus	10-15	1			0.3
Trichiurus lepturus	5-20			1	0.3
Urophycis floridanus	15-20	1			0.3
NEKTONIC INVERTEBRATES					
Trachypeneus similis	< 5	67	14	31	37.3
	5-10	60	8	40	36.0
	TOTAL	127	22	71	73.3
Sicyonia dorsalis	< 5	5		8	4.3
Acetes americanus	< 5		5		1.6
Loliguncula brevis	5-10	1	2		1.0
Callinectes similis	< 5	1		1	0.6
BENTHIC MACROINVERTEBRATES					
Squilla empusa	5-10	4		1	1.6

Table G23 (continued)

Species	Size Class (cm)	Trawl 1	2	3	$\bar{X}$
BENTHIC MACROINVERTEBRATES (con'd)					
Pagurus pollicaris	< 5	1			0.3
Xanthidae unID	< 5			1	0.3
Summary					
Biomass (gm)		682.8	125.0	316.0	374.6
Vertebrates					
species		7	2	4	4.3
individuals		18	26	11	18.3
Nektonic Invertebrates					
species		4	3	3	3.3
individuals		134	29	82	81.6
Benthic Macroinvertebrates					
species		2		2	1.3
individuals		5		2	2.3
Total					
species		13	5	9	9.0
individuals		157	55	99	102.3

The block: 17 spp.; 308 ind.

Table G24. Numbers of individuals of the species collected in three 5 minute trawls in block 14 on 11 March 1976.

Time on: 1415	Surface temp: 19.0	Surface sal: 25.0
Time off: 1440	Bottom temp: 19.0	Bottom sal: 30.0

Species	Size Class (cm)	Trawl 1	Trawl 2	Trawl 3	$\bar{X}$
VERTEBRATES					
Anchoa mitchilli	< 5			3	1.0
	5-10		8	10	6.0
	TOTAL		8	13	7.0
Micropogon undulatus	5-10			1	0.3
	15-20	1			0.3
	TOTAL	1		1	0.6
Cynoscion arenarius	5-10			2	0.6
NEKTONIC INVERTEBRATES					
Trachypeneus similis	< 5			4	1.3
	5-10	1	2	2	1.6
	TOTAL	1	2	6	3.0
Loliguncula brevis	5-10	3	1	3	2.3
Sicyonia dorsalis	< 5		1		0.3
BENTHIC MACROINVERTEBRATES					
Calliactis tricolor	< 5	2		2	1.3
Pagurus pollicaris	< 5	1			0.3
Persephona crinata	< 5			1	0.3
Panopeus herbstii	< 5			1	0.3
Summary					
Biomass (gm)		151	95	134	126.6
Vertebrates					
species		1	1	3	1.6
individuals		1	8	16	8.3
Nektonic Invertebrates					
species		2	3	2	2.3
individuals		4	4	9	5.6

Table G24 (continued)

Species	Size Class (cm)	Trawl 1	2	3	$\bar{X}$
Summary (con'd)					
Benthic Macroinvertebrates					
species		2		3	1.6
individuals		3		4	2.3
Total					
species		5	4	8	5.6
individuals		8	12	29	16.3

The block: 10 spp.; 49 ind.

Table G25. Numbers of individuals of the species collected in three 5 minute trawls in block 27 on 11 March 1976.

Time on: 1445 | Surface temp: 19.0 | Surface sal: 25.0
Time off: 1520 | Bottom temp: 19.0 | Bottom sal: 28.0

Species	Size Class (cm)	Trawl 1	Trawl 2	Trawl 3	$\bar{X}$
VERTEBRATES					
Anchoa mitchilli	< 5	3			1.0
	5-10	14	17	18	16.3
	TOTAL	17	17	18	17.3
Cynoscion arenarius	10-15		5		1.6
Trichiurus lepturus	20-25	1		1	0.6
Larimus fasciatus	5-10	1			0.3
NEKTONIC INVERTEBRATES					
Trachypeneus similis	< 5	3	1	3	2.3
	5-10		12	3	5.0
	TOTAL	3	13	6	7.3
Loliguncula brevis	< 5		1	1	0.6
	5-10		4		1.3
	TOTAL		5	1	2.0
Sicyonia dorsalis	< 5		2	1	1.0
BENTHIC MACROINVERTEBRATES					
Squilla empusa	5-10		1		0.3
Actinaria unID	< 5		1		0.3
Summary					
Biomass (gm)		160	212	94	155.3
Vertebrates					
species		3	2	2	2.3
individuals		19	22	19	20.0
Nektonic Invertebrates					
species		1	3	3	2.3
individuals		3	20	8	10.3

Table G25 (continued)

Species	Size Class (cm)	Trawl 1	Trawl 2	Trawl 3	$\bar{X}$
Summary (con'd)					
Benthic Macroinvertebrates					
species			2		0.6
individuals			2		0.6
Total					
species		4	7	5	5.3
individuals		22	44	27	31.0

The block: 9 spp.; 93 ind.

Table G26. Numbers of individuals of the species collected in three 5 minute trawls in block 2 on 13 May 1976.

Time on: -		Surface temp: -		Surface sal: -
Time off: -		Bottom temp: -		Bottom sal: -

Species	Size Class (cm)	Trawl 1	2	3	X̄
VERTEBRATES					
Polydactylus octonemus	5-10	96	54	24	58.0
	10-15	6	2	4	4.0
	TOTAL	102	56	28	62.0
Micropogon undulatus	< 5		1		0.3
	5-10	15	26	34	25.0
	10-15	8			2.6
	TOTAL	23	27	34	28.0
Cynoscion arenarius	10-15	7	6	13	8.6
Anchoa mitchilli	5-10	1	2	5	2.6
Leiostomus xanthurus	10-15	2			0.6
	15-20	4			1.3
	TOTAL	6			2.0
Larimus fasciatus	5-10		3		1.0
Symphurus civitatus	5-10	1	1		0.6
Trichiurus lepturus	30-35			2	0.6
NEKTONIC INVERTEBRATES					
Callinectes similis	< 5	3	8	1	4.0
Trachypeneus similis	5-10		3	1	1.3
Penaeus setiferus	15-20	1		1	0.6
Ovalipes guadulpensis	< 5			1	0.3
BENTHIC MACROINVERTEBRATES					
Hepatus epheliticus	< 5	1			0.3
Hepatus pudibundus	< 5	1			0.3
Calliactus tricolor	< 5		1		0.3
Pagurus pollicaris	< 5		1		0.3

Table G26 (continued)

Species	Size Class (cm)	Trawl 1	2	3	$\bar{X}$
Summary					
Biomass (gm)		1537.5	861.8	833.7	1077.6
Vertebrates					
species		6	6	5	5.6
individuals		140	95	82	105.6
Nektonic Invertebrates					
species		2	2	4	2.6
individuals		4	11	4	6.3
Benthic Macroinvertebrates					
species		2	2		1.3
individuals		2	2		1.3
Total					
species		10	10	9	9.6
individuals		146	108	86	113.3

The block: 16 spp.; 340 ind.

Table G27. Numbers of individuals of the species collected in three 5 minute trawls in block 15 on 14 May 1976.

Time on: - Surface temp: - Surface sal: -
Time off: - Bottom temp: - Bottom sal: -

Species	Size Class (cm)	Trawl 1	Trawl 2	Trawl 3	$\bar{X}$
VERTEBRATES					
Polydactylus octonemus	5-10	62	30	10	34.0
	10-15	56	13	2	23.6
	TOTAL	118	43	12	57.6
Micropogon undulatus	5-10	19	15	10	14.6
	10-15	8	13	4	8.3
	TOTAL	27	28	14	23.0
Anchoa mitchilli	5-10	5		3	2.6
Cynoscion arenarius	10-15		2	1	1.0
Larimus fasciatus	5-10		1		0.3
Prionotus rubio	5-10		1		0.3
Symphurus civitatus	5-10		1		0.3
NEKTONIC INVERTEBRATES					
Penaeus aztecus	5-10			3	1.0
	10-15	10	4	2	5.3
	TOTAL	10	4	5	6.3
Callinectes similis	< 5	4	1	2	2.3
Loliguncula brevis	< 5	1			0.3
	5-10	1	1	2	1.3
	TOTAL	2	1	2	1.6
Trachypeneus similis	< 5			1	0.3
	5-10	3			1.0
	TOTAL	3		1	1.3
Beroe ovata	< 5	3			1.0
Ovalipes guadelpensis	< 5		1		0.3
Scyphozoa, unID	5-10	1			0.3

Table G27 (continued)

Species	Size Class (cm)	Trawl 1	2	3	$\bar{X}$
BENTHIC MACROINVERTEBRATES					
Hepatus pudibundus	< 5			1	0.3
Summary					
Biomass (gm)		1383.5	705.6	285.2	791.4
Vertebrates					
species		3	6	4	4.3
individuals		150	76	30	85.3
Nektonic Invertebrates					
species		5	4	4	4.3
individuals		23	7	10	13.3
Benthic Macroinvertebrates					
species				1	0.3
individuals				1	0.3
Totals					
species		8	10	9	9.0
individuals		173	83	41	99.0

The block: 15 spp.; 297 ind.

Table G28. Numbers of individuals of the species collected in three 5 minute trawls in block 12 on 14 May 1976.

Time on: - Surface temp: - Surface sal: -
Time off: - Bottom temp: - Bottom sal: -

Species	Size Class (cm)	Trawl 1	Trawl 2	Trawl 3	$\bar{X}$
VERTEBRATES					
Polydactylus octonemus	5-10	64	100	5	56.3
	10-15	59	40	7	35.3
	TOTAL	123	140	12	91.6
Micropogon undulatus	5-10	4	1	4	3.0
	10-15	1	15	1	5.6
	TOTAL	5	16	5	8.6
Cynoscion arenarius	10-15		8	2	3.3
	15-20	4	2		2.0
	TOTAL	4	10	2	5.3
Symphurus civitatus	5-10	2	5	1	2.6
Larimus fasciatus	5-10		3		1.0
	10-15		2		0.6
	TOTAL		5		1.6
Anchoa mitchilli	5-10	2			0.6
Anchoa hepsetus	15-20	1			0.3
Prionotus rubio	< 5			1	0.3
NEKTONIC INVERTEBRATES					
Loliguncula brevis	< 5	3	2	4	3.0
	5-10	2	4	4	3.3
	10-15	1			0.3
	TOTAL	6	6	8	6.6
Callinectes similis	< 5	4	2	3	3.0
Trachypeneus similis	5-10	3		1	1.3
Penaeus aztecus	5-10		1	1	0.6
Chrysaora quinquecirtha	10-15		1		0.3
BENTHIC MACROINVERTEBRATES					
Calliactis tricolor	< 5		2	1	1.0

Table G28 (continued)

Species	Size Class (cm)	Trawl 1	Trawl 2	Trawl 3	$\bar{X}$
BENTHIC MACROINVERTEBRATES (con'd)					
Squilla empusa	5-10		1		0.3
Pagurus pollicaris	< 5			1	0.3
Summary					
Biomass (gm)		1172.9	1761.4	342.8	1092.4
Vertebrates					
species		6	5	5	5.3
individuals		137	176	21	111.3
Nektonic Invertebrates					
species		3	4	4	3.6
individuals		13	10	13	12.0
Benthic Macroinvertebrates					
species			2	2	1.3
individuals			3	2	1.6
Total					
species		9	11	11	10.3
individuals		150	189	36	125.0

The block: 16 spp.; 375 ind.

Table G29. Numbers of individuals of the species collected in three 5 minute trawls in block 14 on 14 May 1976.

Time on: -　　Surface temp: -　　Surface sal: -
Time off: -　　Bottom temp: -　　Bottom sal: -

Species	Size Class (cm)	Trawl 1	2	3	$\bar{X}$
VERTEBRATES					
Symphurus civitatus	5-10	19	2	7	9.3
	10-15	1		1	0.6
	TOTAL	20	2	8	10.0
Polydactylus octonemus	5-10	2	3	2	2.3
	10-15	3	8		3.6
	TOTAL	5	11	2	6.0
Prionotus rubio	< 5	7			2.3
	5-10	5		3	2.6
	TOTAL	12		3	5.0
Anchoa mitchilli	5-10		13		4.3
Ogcocephalus nasutus	5-10	2			0.6
Micropogon undulatus	10-15		1		0.3
Citharichthys spilopterus	5-10			1	0.3
NEKTONIC INVERTEBRATES					
Trachypeneus similis	< 5	13		15	9.3
	5-10	47		53	33.3
	TOTAL	60		68	42.6
Callinectes similis	< 5	49		36	28.3
	5-10	2			0.6
	TOTAL	51		36	29.0
Beroe ovata	< 5	21			7.0
Sicyonia dorsalis	< 5	2		5	2.3
	5-10	2			0.6
	TOTAL	4		5	3.0
Callinectes sapidus	15-20	2			0.6
Natantia unID	< 5	1			0.3
Penaeus aztecus	5-10		1		0.3
Portunus gibbesi	5-10		1		0.3

Table G29 (continued)

Species	Size Class (cm)	Trawl 1	Trawl 2	Trawl 3	$\bar{X}$
<u>NEKTONIC INVERTEBRATES</u> (con'd)					
Penaeus setiferus	15-20			1	0.3
<u>BENTHIC MACROINVERTEBRATES</u>					
Squilla empusa	< 5		4	~~4~~	1.3
	5-10	3	4	3	3.3
	TOTAL	3	8	3	4.6
Actinaria, sand encrusted	< 5			5	1.6
Calliactis tricolor	< 5	1		2	1.0
Metophorhaphis calcarata	< 5	2			0.6
Cantharus cancellarius	< 5		1	1	0.6
Pagurus pollicaris	5-10			1	0.3
Persephona crinata	< 5			1	0.3
Squid egg cluster		1			0.3
Summary					
Biomass (gm)		918.1	194.3	376.7	496.4
Vertebrates					
species		4	4	4	4.0
individuals		39	27	14	26.6
Nektonic Invertebrates					
species		6	2	4	4.0
individuals		139	2	110	83.6
Benthic Macroinvertebrates					
species		4	2	6	4.0
individuals		7	9	13	9.6
Total					
species		14	8	14	12.0
individuals		185	38	137	120.0

The block: 24 spp.; 360 ind.

Table G30. Numbers of individuals of the species collected in three 5 minute trawls in block 27 on 14 May 1976.

Time on: -	Surface temp: -	Surface sal: -
Time off: -	Bottom temp: -	Bottom sal: -

Species	Size Class (cm)	Trawl 1	Trawl 2	Trawl 3	$\bar{X}$
VERTEBRATES					
Polydactylus octonemus	5-10	72		23	31.6
	10-15	26	2	9	12.3
	TOTAL	98	2	32	44.0
Symphurus civitatus	5-10		5	3	2.6
	10-15		1		0.3
	TOTAL		6	3	3.0
Anchoa mitchilli	5-10	3	2		1.6
Micropogon undulatus	5-10		1	1	0.6
Prionotus rubio	< 5		1		0.3
	5-10		1		0.3
	TOTAL		2		0.6
Cynoscion arenarius	< 5			1	0.3
	10-15			1	0.3
	TOTAL			2	0.6
Peprilus burti	10-15	2			0.6
NEKTONIC INVERTEBRATES					
Trachypeneus similis	< 5			3	1.0
	5-10	3	1	10	4.6
	10-15		4		1.3
	TOTAL	3	5	13	7.0
Callinectes similis	< 5	2	8	9	6.3
	5-10		1		0.3
	TOTAL	2	9	9	6.6
Sicyonia dorsalis	< 5	2	7	5	4.6
Loliguncula brevis	< 5	5		3	2.6
	5-10	3		1	1.3
	TOTAL	8		4	4.0
Penaeus aztecus	5-10			1	0.3
	10-15			1	0.3
	TOTAL			2	0.6

Table G30 (continued)

Species	Size Class (cm)	Trawl 1	2	3	$\bar{X}$
BENTHIC MACROINVERTEBRATES					
Libinia dubia	< 5		1		0.3
Summary					
Biomass (gm)		917.8	129.3	375.6	474.2
Vertebrates					
species		3	5	4	4.0
individuals		103	13	38	51.3
Nektonic Invertebrates					
species		4	3	5	4.0
individuals		15	21	33	23.0
Benthic Macroinvertebrates					
species			1		0.3
individuals			1		0.3
Total					
species		7	9	9	8.3
individuals		118	35	71	74.6

The block: 13 spp.; 224 ind.

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Table G31. Comparison of trawl data collected in the mud plume as the dredged dropped its load, near buoy D and in clean water nearby. Data was collected on 4 September 1975.

Species	Size Class (cm)	Clear Water 1230	Plume Time 1600	Clear Water 1615
VERTEBRATES				
Micropogon undulatus	10-15	10	96	1
Anchoa hepsetus	5-10	2		
	10-15	4		
	TOTAL	6		
Cynoscion arenarius	10-20	1	3	
	20-30	1		
	TOTAL	2	3	
Chloroscombrus chrysurus	< 10	1		5
	10-20	1	1	1
	TOTAL	2	1	6
Cynoscion nothus	10-20		3	
	20-30	1		
	TOTAL	1	3	
Leiostomus xanthurus	10-20	1		
Citharichthys spilopterus	10-20	1		1
Stellifer lanceolatus	< 10		8	
	10-20		35	
	TOTAL		43	
Arius felis	10-20		31	
	20-30		37	
	TOTAL		68	
Prionotus rubio	10-20		1	
Sphaeroides parvus			1	1
Symphurus civitatus	10-20			3
NEKTONIC INVERTEBRATES				
Penaeus aztecus	< 10	2	1	1
	10-20	2	1	3
	TOTAL	4	2	4
Callinectes similis	< 10	1	2	8

Table G31 (continued)

Species	Size Class (cm)	Clear Water 1230	Plume Time 1600	Clear Water 1615
NEKTONIC INVERTEBRATES (con'd)				
Xiphopeneus krøyeri	< 10		15	
Scyphozoa			3	1
Penaeus setiferus	10-20		1	
Sicyonia dorsalis	< 10			2
Trachypeneus similis	< 10			4
BENTHIC MACROINVERTEBRATES				
Squilla empusa	< 10	4		
Cantharus cancellarius	< 5	1		
Polinices duplicatus	< 5		1	1
Persephona crinata	< 10			1
Persephona aquilonaris	< 10			1
Actinaria	< 10			1
Xanthidae	< 10			2
Summary				
Biomass (gm)		956	7803	375
Vertebrates				
species		7	8	5
individuals		23	216	12
Nektonic Invertebrates				
species		2	5	5
individuals		5	23	19
Benthic Macroinvertebrates				
species		2	1	6
individuals		5	1	7
Total				
species		11	14	16
individuals		33	240	38

Table G32. Comparison of trawl data from two replicate 5 minute tows at the disposal site near buoy D and in a nearby upcurrent control area. Data collected on 9 September 1975, while maintenance dredging was being conducted.

		Buoy D		Control	
		Time			
		1540	1550	1601	1615
Species	Size Class	Replicates			
	(cm)	1	2	1	2
VERTEBRATES					
Micropogon undulatus	11-15	2		8	2
	16-20			4	2
	TOTAL	2		12	4
Sphaeroides parvus	5-10	1			
Symphurus civitatus	10-15		1	1	
Urophycis floridanus	15-20				1
NEKTONIC INVERTEBRATES					
Callinectes sapidus	5-10	1	1	1	
Penaeus aztecus	5-10	1		1	
	10-15	2		6	
	TOTAL	3			
Sicyonia dorsalis	< 5	1			
Beroe ovata			50		10
Xiphopeneus krøyeri	5-10		4	2	
Loliguncula brevis	< 5			1	1
	5-10			1	1
	TOTAL			2	1
Dactylometra quinquecirrha					2
BENTHIC MACROINVERTEBRATES					
Squilla empusa	< 5			1	
	5-10		1		
	TOTAL		1	1	
Anadara transversa	< 5				1

Table G32 (continued)

Species	Size Class (cm)	Buoy D Time 1540 Replicates 1	 1550 2	Control 1601 1	 1615 2
Summary					
Biomass (gm)					
Vertebrates					
species		2	1	2	2
individuals		3	1	13	5
Nektonic Invertebrates					
species		4	2	4	2
individuals (excluding Beroe)		5	5	12	4
Benthic Macroinvertebrates					
species			1	1	1
individuals			1	1	1
Total					
species		6	4	7	5
individuals		8	7	26	10

Tabl[illegible]

Stomach Contents of Selected Fishes [illegible]cted at Station T2 in the Offshore

Disposal Area, Galveston, Texas on 7/25/75

	Trawl 1										Trawl 2									
	A. felis	*M. americanus*	*M. americanus*	*P. octonemus*	*P. octonemus*	*L. xanthurus*	*L. xanthurus*	*L. xanthurus*	*L. xanthurus*	*L. xanthurus*	*L. fasciatus*	*C. faber*	*C. faber*	*M. undulatus*	*M. undulatus*	*M. undulatus*	*M. undulatus*	*M. undulatus*	*M. undulatus*	*M. undulatus*
Percent Full	F	25	F	20	F	F	50	20	20	5	5	F	F	F	20	50	F	T	T	F
PERCENT COMPOSITION																				
Detritus		50				40	20	90	90	100		25	100		75	25	50	T	T	50
Unk. Animal Tissue						60						75		100						
NUMERICAN COMPOSITION																				
Trachypeneus similis		2	1								2				2	1				
Glycinde solitaria																2				3
Pinnixa cristata	1																			
Squilla empusa					1															
unk. shrimp				1	2														1	
unk. crustacean							1	1	1											
unk. polychaete															1		1			1
unk. portunid crab Megalops															1					

Table G33 (concluded)

Trawl 3

	C. faber	*C. faber*	*P. rubio*	*P. rubio*	*L. xanthurus*	*L. xanthurus*	*C. nothus*	*C. nothus*	*P. octonemus*	*P. octonemus*
Percent Full	50	F	F	50	F	F	E	F	20	F
PERCENT COMPOSITION										
Detritus	100	50			50	50				
Unk. Animal Tissue		50						100		
NUMERICAL COMPOSITION										
Trachypeneus similis				2	2					2
Glycinde solitaria										
Pinnixa cristata										
Squilla empusa										1
unk. shrimp			1	1					1	
unk. crustacean										
unk. polychaete						3				
unk. portunit crab										
Megalops				7						

Table G34

Stomach Contents of Selected Fishes Collected at Station T15 in the Offshore

Disposal area, Galveston, Texas on 7/25/75

	Trawl 1										Trawl 2									
	A. felis	*M. americanus*	*M. americanus*	*P. octonemus*	*P. octonemus*	*L. xanthurus*	*L. xanthurus*	*L. xanthurus*	*L. xanthurus*	*L. xanthurus*	*L. fasciatus*	*C. faber*	*C. faber*	*M. undulatus*	*M. undulatus*	*M. undulatus*	*M. undulatus*	*M. undulatus*	*M. undulatus*	*M. undulatus*
Percent Full	E	20	T	20	F	F	50	75	50	25	33	T	T	50	50	50	F	25	50	
PERCENT COMPOSITION																				
Detritus		100	T	50	40		50		25	50	75	T	T		25	25			50	
Unk. Animal Tissue				50					25											
Unk. crustacean tissue								100												
Unk. Trachypeneus Tissue											25			100						
NUMERICAL COMPOSITION																				
Trachypeneus similis					1	1														
Glycinde solitaria							2		3	1										
Unk. polychaete										1					1	2			1	
Squilla empusa																	1	1		

Table G34 (Concluded)

Trawl 3

	P. rubio	*L. fasciatus*	*L. fasciatus*	*P. octonemus*	*P. octonemus*	*M. undulatus*	*M. undulatus*	*M. undulatus*	*M. undulatus*	*M. undulatus*
Percent Full	F	5.	E	F	F	F	50	F	T	T
PERCENT COMPOSITION										
Detritus						25	25			T
Unk. Animal Tissue										T
Unk. crustacean Tissue										
Unk. Trachypeneus Tissue										
NUMERICAL COMPOSITION										
Trachypeneus similis					3	1				
Glycinde soliataria							1			
Unk. polychaete										
Squilla empusa				1						
Balanglossus sp.								1		
Unk. portunid	2									
Symphurus civitatus					1					
Anaitides erythrophyllus					2					
Prionospio pinnata						1	2		2	
unk. shrimp		4								
unk. caridean shrimp					1					

Table G35

Stomach Contents of Selected Fishes Collected at Station T12 in the Offshore

Disposal Area, Galveston, Texas on 7/25/75

	Trawl 1										Trawl 2									
	S. lanceolatus	*S. lanceolatus*	*P. octonemus*	*P. octonemus*	*P. octonemus*	*P. octonemus*	*M. undulatus*	*M. undulatus*	*M. undulatus*	*M. undulatus*	*L. xanthurus*	*P. rubio*	*P. rubio*	*P. octonemus*	*P. octonemus*	*P. octonemus*	*P. octonemus*	*P. octonemus*	*P. octonemus*	*C. arenarius*
Percent full	E	E	F	F	50	F	F	50	F	F	T	F	F	F	F	F	25	33	F	F
PERCENT COMPOSITION																				
Detritus						50	20	50	5	50	T	50								
Unk. animal tissue								50	95											
Trachypeneus tissue															100					
Copepod tissue																				33
NUMERICAL COMPOSITION																				
Acetes americanus																		1		4
Trachypeneus similis						2							2	4		3	1			
Nereis succinea							1													
Pilargidae																				
Labidocera aestiva																				
Lumbrineridae																				
Pinnixa cristata						1														
Balanoglossus sp.										1										
Ampelisca abdita										1										
Anaitides erythrophyllus						1														
Unknown xanthid																				

Table G35 (continued)

Trawl 3

	M. undulatus	*M. undulatus*	*P. rubio*	*P. rubio*	*P. rubio*	*P. rubio*	*P. octonemus*	*P. octonemus*	*P. octonemus*	*P. octonemus*
Percent full	50	50	F	F	F	F	F	F	F	F
PERCENT COMPOSITION										
Detritus	50	50					25			
Unk. animal tissue										
Trachypeneus tissue										
Copepod tissue										
NUMERICAL COMPOSITION										
Acetes americanus										1
Trachypeneus similis			19	3	3	1	3	2		1
Nereis succinea										
Pilargidae		1								
Labidocera aestiva					1		3			
Lumbrineridae		1								
Pinnixa cristata										
Balanoglossus										
Ampelisca abdita										
Anaitides srythrophyllus										
Unknown xanthid			2							

Table G35 (continued)

	Trawl 1										Trawl 2									
	S. lanceolatus	*S. lanceolatus*	*P. octonemus*	*P. octonemus*	*P. octonemus*	*P. octonemus*	*M. undulatus*	*M. undulatus*	*M. undulatus*	*M. undulatus*	*L. xanthurus*	*P. rubio*	*P. rubio*	*P. octonemus*	*P. octonemus*	*P. octonemus*	*P. octonemus*	*P. octonemus*	*P. octonemus*	*C. arenarius*
Unk. shrimp				2	2															
Unk. polychaete							1					1								
Mysidopsis sp.			9															2	10	
Nassarius acutus			1																	
Megalops larva													1				2			2
Squilla empusa														1		1				
Unk. copepods																	2			
Unk. amphipod																				

Table G35 (concluded)

Trawl 3

	M. undulatus	*M. undulatus*	*P. rubio*	*P. rubio*	*P. rubio*	*P. rubio*	*P. octonemus*	*P. octonemus*	*P. octonemus*	*P. octonemus*
Unk. shrimp										
Unk. polychaete	2									
Mysidopsis sp.										
Nassarius acutus										
Megalops				1						
Squilla empusa			1	1		1		1	1	
Unk. copepods										
Unk. amphipod					1					

Table G36

Stomach Contents of Selected Fishes Collected at Station T14 in the Offshore

Disposal Area, Galveston, Texas on 7/25/75

	Trawl 1										Trawl 2									
	P. rubio	*P. octonemus*	*P. octonemus*	*M. undulatus*	*M. undulatus*	*S. lanceolatus*	*S. lanceolatus*	*S. lanceolatus*	*S. lanceolatus*	*S. lanceolatus*	*M. undulatus*	*S. lanceolatus*	*S. lanceolatus*	*S. lanceolatus*	*S. lanceolatus*	*S. lanceolatus*	*P. octonemus*	*P. octonemus*	*P. octonemus*	*P. octonemus*
Percent full	F	25	20	50	E	T	T	T	T	T	F	F	50	E	E	E	F	75	25	50
PERCENT COMPOSITION																				
Detritus			50	50		T	T	T	T	T	100	100	75							50
Unk. animal tissue													25							
Unk. Trachypeneus tissue																				
NUMERICAL COMPOSITION																				
Trachypeneus similis	2			1													7	8	2	1
Pinnixa cristata	4																			
Balanoglossus sp.																				
Ampelisca abdita																				
Megalops larva	1																			
Unk. xanthid	3																			
Lepidasthenia sp.				1																
Unk. shrimp		3	1																	
Unk polychaete																				

Table G36 (concluded)

Trawl 3

	P. rubio	*M. undulatus*	*M. undulatus*	*P. octonemus*	*P. octonemus*	*P. octonemus*	*P. octonemus*	*P. octonemus*	*P. octonemus*	*P. octonemus*
Percent full	F	50	50	E	25	25	50	33	33	50
PERCENT COMPOSITION										
Detritus		50	50							
Unk. animal tissue										
Unk. Trachypeneus tissue							100			
NUMERICAL COMPOSITION										
Trachypeneus similis	3				5	3		4	4	1
Pinnixa cristata										
Balanoglossus sp.			2							
Ampelisca abdita		1								
Megalops larva										
Unk. xanthid										
Lepidasthenia sp.										
Unk. shrimp										
Callinectes similis	1									
Unk. polychaete		1								

Table G37

Stomach Contents of Selected Fishes Collected at Station T27 in the Offshore

Disposal Area, Galveston, Texas on 7/25/75

	Trawl 1	Trawl 2									
		M. undulatus	*P. rubio*	*P. rubio*	*P. octonemus*	*P. octonemus*	*P. octonemus*	*P. octonemus*	*P. octonemus*	*P. octonemus*	*P. octonemus*
Percent full		50	F	F	75	F	33	F	25	50	50
PERCENT COMPOSITION											
Detritus		50								20	20
Unk. animal tissue		50									
Unk. shrimp tissue	No Fish Selected										
NUMERICAL COMPOSITION											
Trachypeneus similis			2		8	22	2				3
Acetes americanus								8		2	
Nereis succinea									1		
Glycinde solitaria									1		
Labidocera aestiva								4			
Pinnixa cristata			1								
Ampelisca abdita								1	1		3
Squilla empusa				2	1						
Megalops larva										1	1
Unk. shrimp										1	
Prionospio pinnata											

Table G37 (concluded)

Trawl 3

	S. civitatus	*M. undulatus*	*P. octonemus*	*P. octonemus*	*P. octonemus*
Percent full	T	F	10	75	65
PERCENT COMPOSITION					
Detritus	T	20		25	
Unk. animal tissue					
Unk. shrimp tissue			100		
NUMERICAL COMPOSITION					
Trachypeneus similis				4	6
Acetes americanus					
Nereis succinea					
Glycinde solitaria				1	
Labidocera aestiva					
Pinnixa cristata					
Ampelisca abdita					
Squilla empusa					
Megalops larva					
Unk. shrimp					
Prionospio pinnata		2			

Table G38

Stomach Contents of Selected Fishes Collected at Station T2 in the Offshore

Disposal Area, Galveston, Texas on 9/18/75

	Trawl 1					Trawl 2				
Percent full	50	E	F	F	5	F	F	F	F	F
PERCENT COMPOSITION										
Detritus						100			50	10
Unk. animal tissue							100	100	50	
NUMERICAL COMPOSITION										
Acetes americanus										1
Labidocera aestiva	5		56	25						
Ectinosoma sp.				2	3					
Mysidopsis sp.			3	1						
Megalops larva				1						

Table G38 (concluded)

<u>Trawl 3</u>

Percent full	No Fish Selected
PERCENT COMPOSITION	
Detritus	
Unk. animal tissue	
NUMERICAL COMPOSITION	
Acetes americanus	
Labidocera aestiva	
Ectinosoma sp.	
Mysidopsis sp.	
Megalops larva	

Table G39

Stomach Contents of Selected Fishes Collected at Station T15 in the Offshore Disposal Area, Galveston, Texas on 9/18/75

	Trawl 1										Trawl 2									
	M. undulatus	*M. undulatus*	*M. undulatus*	*M. undulatus*	*C. chrysurus*	*C. chrysurus*	*C. chrysurus*	*C. chrysurus*	*C. chrysurus*	*C. chrysurus*	*M. undulatus*	*P. octonemus*	*P. octonemus*	*S. lanceolatus*	*S. lanceolatus*	*S. lanceolatus*	*S. lanceolatus*	*S. lanceolatus*	*S. lanceolatus*	*S. lanceolatus*
Percent full	F	60	60	50	F	F	F	F	F	T	F	F	F	50	T	E	E	E	E	E
PERCENT COMPOSITION																				
Detritus		50	50	50																
Unk. animal tissue			50							T	100									
NUMERICAL COMPOSITION																				
Acetes americanus					36	40	24	28	48					1						
Trachypeneus similis		1		1								10	7							
Glycinde solitaria	1	2																		
Larval sciaenids					3	1	1	10	6											
Pinnixa cristata	1																			
Balanoglossus sp.	4	1		1																
Prionospio pinnata	3	4		1																
Megalops larva				2																
Unk. amphipod					1															
Unk. copepod							1													
Unk. xanthid												1								
Unk polychaete															2					

Table G39 (concluded)

Trawl 3

	C. chrysurus	*M. undulatus*	*M. undulatus*	*M. undulatus*	*M. undulatus*	*M. undulatus*	*M. undulatus*	*M. undulatus*	*M. undulatus*	*M. undulatus*
Percent full	F	25	25	25	25	25	25	25	25	E
PERCENT COMPOSITION										
Detritus		50		20	20	50	50	50	20	
Unk. animal tissue										
NUMERICAL COMPOSITION										
Acetes americanus	26			2				1		
Trachypeneus similis		1			1				3	
Glycinde solitaria										
Larval sciaenids										
Pinnixa cristata					1					
Balanoglossus sp.			1							
Prionospio pinnata										
Megalops larva										
Unk. amphipod										
Unk. copepod										
Unk. xanthid										
Unk polychaete						1	1	1		

Table G40

Stomach Contents of Selected Fishes Collected at Station T14 in the Offshore Disposal Area, Galveston, Texas on 9/18/75

	Trawl 1	Trawl 2									
		P. octonemus	*P. octonemus*	*M. undulatus*	*M. undulatus*	*M. undulatus*	*M. undulatus*	*M. undulatus*	*M. undulatus*	*M. undulatus*	*M. undulatus*
Percent full		75	F	50	E	F	F	F	F	F	F
NUMERICAL COMPOSITION											
Detritus				100		60	70	50	50	50	5
Unk. animal tissue								50			
Unk. polychaete tissue	No Fish Selected									50	
Unk. shrimp tissue											
Unk. crustacean tissue											
NUMERICAL COMPOSITION											
Acetes americanus		1	37								
Trachypeneus similis		1	2								
Larval sciaenids			1								
Armandia agilis											
Pinnixa cristata		1	2								
Mysidopsis sp.			36								
Nuculana concentrica						1	1				
Megalops larva							1				
Sigambra wassi									2	2	
Unk. xanthid											

Table G40 (continued)

Trawl 3

	C. chrysurus	*C. nothus*	*C. nothus*	*M. undulatus*	*M. undulatus*	*M. undulatus*	*P. octonemus*	*P. octonemus*	*P. octonemus*	*P. octonemus*
Percent full	E	20	F	F	F	F	F	F	F	F
PERCENT COMPOSITION										
Detritus			50	25	60	50				
Unk. animal tissue										
Unk. polychaete tissue										
Unk. shrimp tissue		100								
Unk. crustacean tissue				70						
NUMERICAL COMPOSITION										
Acetes americanus			1				31	13	29	
Trachypeneus similis								18	4	23
Nereis succinea						1				
Larval sciaenids										
Armandia agilis					3					
Pinnixa cristata										
Mysidopsis sp.										
Nuculana concentrica										
Megalops larva									1	
Sigambra wassi										
Unk. xanthid								1		

Table G40 (continued)

	Trawl 1	Trawl 2										
		P. octonemus	*P. octonemus*	*M. undulatus*	*M. undulatus*	*M. undulatus*	*M. undulatus*	*M. undulatus*	*M. undulatus*	*M. undulatus*	*M. undulatus*	*M. undulatus*
NUMERICAL COMPOSITION (continued)												
Unk. fish												
Post-larval shrimp												
Unk. bivalve												

Table G40 (concluded)

Trawl 3

NUMERICAL COMPOSITION (concluded)	*C. chrysurus*	*C. nothus*	*C. nothus*	*M. undulatus*	*M. undulatus*	*M. undulatus*	*P. octonemus*	*P. octonemus*	*P. octonemus*	*P. octonemus*
Unk. fish									1	
Post-larval shrimp							27			
Unk. bivalve				1						

Table G41

Stomach Contents of Selected Fishes Collected at Station T2 in the Offshore Disposal Area, Galveston, Texas on 12/6/75

	Trawl 1										Trawl 2									
	C. arenarius	*C. arenarius*	*C. arenarius*	*C. arenarius*	*C. arenarius*	*C. arenarius*	*C. arenarius*	*L. fasciatus*	*L. fasciatus*	*L. fasciatus*	*C. civitatus*	*C. civitatus*	*C. civitatus*	*C. civitatus*	*C. arenarius*	*C. arenarius*	*S. lanceolatus*	*S. lanceolatus*	*L. fasciatus*	*L. fasciatus*
Percent full	F	F	F	75	50	E	E	25	5	E	50	T	E	E	F	50	25	E	25	E
PERCENT COMPOSITION																				
Detritus											50	T								
Unk. animal tissue			100	100	100											50	50		50	
Unk. shrimp tissue																			50	
NUMERICAL COMPOSITION																				
Labidocera aestiva																				
Unk. shrimp								1												
Unk. fish	1	1																		
Unk. polychaete											1									
Unk. xanthid															1	1				
Anchoa mitchelli															2					
Plastic beads																	2			
Unk. nematodes									3											

Table G41 (concluded)

Trawl 3

Percent full	50	E	25	E	F	F	F	E	E	E
PERCENT COMPOSITION										
Detritus	100									
Unk. animal tissue										
Unk. shrimp tissue										
NUMERICAL COMPOSITION										
Labidocera aestiva			6							
Unk. shrimp					1					
Unk. fish						1	1			
Unk. polychaete										
Unk. xanthid										
Anchoa mitchelli										
Plastic beads										
Unk. nematodes										

Table G42

Stomach Contents of Selected Fishes Collected at Station T15 in the Offshore Disposal Area, Galveston, Texas on 12/6/75

	Trawl 1										Trawl 2									
	S. civitatus	*S. civitatus*	*C. faber*	*C. arenarius*	*C. arenarius*	*C. arenarius*	*C. arenarius*	*M. undulatus*	*S. lanceolatus*	*S. lanceolatus*	*C. arenarius*	*C. arenarius*	*C. arenarius*	*C. arenarius*	*C. arenarius*	*L. fasciatus*	*L. fasciatus*	*L. fasciatus*	*L. fasciatus*	*M. americanus*
Percent full	T	E	E	F	F	F	50	E	50	E	F	F	50	50	T	F	F	F	F	F
PERCENT COMPOSITION																				
Detritus	T														T				50	
Unk. animal tissue							100						100	100					50	
NUMERICAL COMPOSITION																				
Labidocera aestiva																				
Larval sciaenids											3	1				1	1	1		
Anchoa mitchelli				5																
Micropogon undulatus					2	1			1											
Unk. copepod												1					1			
Diopatra cuprea																			1	
Unk. shrimp																			1	
Mysidopsis sp.																				
Plastic beads																				

Table G42 (concluded)

Trawl 3

Percent full	F	F	F	F	75	E	F	F	F	F
PERCENT COMPOSITION										
Detritus				50					50	
Unk. animal tissue										
NUMERICAL COMPOSITION										
Labidocera aestiva			8							
Larval sciaenids	1	1	1	1	1		1	2	1	1
Anchoa mitchelli										
Micropogon undulatus										
Unk. copepod								1		
Diopatra cuprea										
Unk. shrimp										
Mysidopsis sp.		3								
Plastic beads			3							

Table G43

Stomach Contents of Selected Fishes Collected at Station T12 in the Offshore

Disposal Area, Galveston, Texas on 12/6/75

	Trawl 1									Trawl 2									
	S. civitatus	*S. civitatus*	*S. civitatus*	*S. civitatus*	*S. civitatus*	*M. undulatus*	*M. undulatus*	*C. arenarius*	*S. lanceolatus*	*S. civitatus*	*S. civitatus*	*S. civitatus*	*M. undulatus*	*M. undulatus*	*C. arenarius*	*C. arenarius*	*C. arenarius*	*S. lanceolatus*	*S. lanceolatus*
Percent full	50	25	12	12	E	F	50	F	E	50	25	E	F	T	F	E	E	20	E
PERCENT COMPOSITION																			
Detritus		50								50	100			T					
Unk. animal tissue		50								50					50			50	
Unk. crustacean tissue			100																
NUMERICAL COMPOSITION																			
Prionospio pinnata																			
Acetes americanus							1	17											
Trachypeneus similis																			
Unk. nematode																			
Nereis sp.																			
Ectinosoma sp.																			
Anchoa mitchelli																			
Larval sciaenids														1					
Pinnixa cristata				1															
Unk. crustacean	1																		
Unk. amphipod				3															
Squilla empusa						1													

Table G43 (continued)

Trawl 3

	S. civitatus	*S. civitatus*	*S. civitatus*	*M. undulatus*	*M. undulatus*	*M. undulatus*	*S. lanceolatus*	*S. lanceolatus*	*S. lanceolatus*	*S. lanceolatus*
Percent full	50	25	E	F	F	F	F	12	E	E
PERCENT COMPOSITION										
Detritus										
Unk. animal tissue										
Unk. crustacean tissue										
NUMERICAL COMPOSITION										
Prionospio pinnata				2						
Acetes americanus					2	4	1			
Trachypeneus similis					1					
Unk. nematode						1				
Nereis sp.	1						1			
Ectinosoma sp.		1								
Anchoa mitchelli					1					
Larval sciaenids										
Pinnixa cristata										
Unk. crustacean				1				1		
Unk. amphipod		12								
Squilla empusa										

Table G43 (continued)

	Trawl 1									Trawl 2									
	S. civitatus	*S. civitatus*	*S. civitatus*	*S. civitatus*	*S. civitatus*	*S. civitatus*	*M. undulatus*	*C. arenarius*	*S. lanceolatus*	*S. civitatus*	*S. civitatus*	*S. civitatus*	*M. undulatus*	*M. undulatus*	*C. arenarius*	*C. arenarius*	*C. arenarius*	*S. lanceolatus*	*S. lanceolatus*
NUMERICAL COMPOSITION (continued)																			
Post-larval shrimp													1						
Plastic beads													1						
Unk. shrimp															1				
Unk. copepod																		1	
Unk. polychaete																			
Mysidopsis sp.																			
Unk. fish																			
Megalops larva																			

Table G43 (concluded)

Trawl 3

NUMERICAL COMPOSITION (continued)	*S. civitatus*	*S. civitatus*	*S. civitatus*	*M. undulatus*	*M. undulatus*	*M. undulatus*	*S. lanceolatus*	*S. lanceolatus*	*S. lanceolatus*
Post-larval shrimp									
Plastic beads				2		1			
Unk. shrimp									
Unk. copepod									
Unk. polychaete			1						
Mysidopsis sp.			3						
Unk. fish							1		
Megalops larva								1	

Table G44

Stomach Contents of Selected Fishes Collected at Station T14 in the Offshore Disposal Area, Galveston, Texas on 12/6/75

	Trawl 1				Trawl 2									
	S. civitatus	*C. arenarius*	*C. arenarius*	*C. faber*	*S. civitatus*	*S. civitatus*	*C. faber*	*C. faber*	*O. chrysoptera*	*M. undulatus*	*O. philadelphica*	*C. arenarius*	*C. arenarius*	*C. arenarius*
Percent full	E	E	F	12	F	E	E	E	50	E	F	F	50	50
PERCENT COMPOSITION														
Detritus				100										
Unk. crustacean tissue			50								100		50	
NUMERICAL COMPOSITION														
Acetes americanus			3									7	3	1
Nereis sp.					1									
Unk. crustacean									1					
Unk. shrimp													1	

Table G44 (concluded)

Trawl 3

Percent full	
PERCENT COMPOSITION	
Detritus	No Fish Selected
Unk. crustacean tissue	
NUMERICAL COMPOSITION	
Acetes americanus	
Nereis sp.	
Unk. crustacean	
Unk. shrimp	

Table G45

Stomach Contents of Selected Fishes Collected at Station T27 in the Offshore Disposal Area, Galveston, Texas on 12/6/75

	Trawl 1	Trawl 2									
		M. undulatus	*M. undulatus*	*C. faber*	*C. arenarius*	*C. arenarius*	*C. arenarius*	*C. arenarius*	*C. arenarius*	*C. arenarius*	*C. arenarius*
Percent full		F	50	E	F	F	F	50	25	20	E
PERCENT COMPOSITION											
Detritus											
Unk. animal tissue	No Fish Selected										
Unk. crustacean tissue			25								
NUMERICAL COMPOSITION											
Prionospio pinnata		3	2								
Trachypeneus similis					6	4					
Labidocera aestiva											
Larval sciaenids					1						
Ampelisca abdita			1								
Unk. shrimp		2					2	2	1		
Mysidopsis sp.										1	
Unk. crustacean											
Post-larval shrimp											
Anaitides erythrophyllus											
Unk. fish											

Table G45 (concluded)

Trawl 3

	C. arenarius	*C. arenarius*	*C. arenarius*	*C. arenarius*	*C. arenarius*	*M. undulatus*	*S. lanceolatus*	*S. civitatus*	*S. civitatus*	*S. civitatus*
Percent full	F	F	F	F	50	F	F	50	E	E
PERCENT COMPOSITION										
Detritus								50		
Unk. animal tissue								50		
Unk. crustacean tissue										
NUMERICAL COMPOSITION										
Prionospio pinnata										
Acetes americanus		3		1	4					
Labidocera aestiva			1							
Larval sciaenids		1								
Ampelisca abdita						10				
Unk. shrimp										
Mysidopsis sp.			3				37			
Unk. crustacean			1							
Post-larval shrimp				3						
Anaitides erythrophyllus							1			
Unk. fish	1									

Table G46

Stomach Contents of Selected Fishes Collected at Station T12 in the Offshore Disposal Area, Galveston, Texas on 1/20/76

	Trawl 1											Trawl 2								
	S. civitatus	*S. civitatus*	*S. civitatus*	*S. civitatus*	*S. civitatus*	*S. civitatus*	*S. civitatus*	*S. civitatus*	*C. arenarius*	*L. xanthurus*	*S. civitatus*	*S. civitatus*	*S. civitatus*	*S. civitatus*	*L. xanthurus*	*L. xanthurus*	*L. xanthurus*	*L. xanthurus*	*L. xanthurus*	*L. xanthurus*
Percent full	F	50	50	50	25	20	E	E	F	F	50	T	T	T	50	E	E	E	E	E
PERCENT COMPOSITION																				
Detritus		50	100							50		T	T	T						
Unk. animal tissue	100									50										
Unk. crustacean tissue				100																
NUMERICAL COMPOSITION																				
Unk. nematode									1											
Labidocera aestiva															12					
Ectinosoma sp.															73					
Unk. polychaete									2											
Balanoglossus sp.									5											
Ampelisca abdita		1			1	1					6	1								
Unk. green polychaete															2					

Table G46 (concluded)

Trawl 3

	S. civitatus	*S. civitatus*	*S. civitatus*	*S. civitatus*	*S. civitatus*	*S. civitatus*	*S. civitatus*	*S. civitatus*	*S. civitatus*	*S. civitatus*
Percent full	50	50	20	5	T	T	E	E	E	E
PERCENT COMPOSITION										
Detritus	50	50	50		T	T				
Unk. animal tissue	50									
Unk. crustacean tissue										
NUMERICAL COMPOSITION										
Unk. nematode										
Labidocera aestiva										
Ectinosoma sp.										
Unk. polychaete										
Balanoglossus sp.										
Ampelisca abdita		1	1	1						
Unk. green polychaete										

Table G47

Stomach Contents of Selected Fishes Collected at Station T14 in the Offshore Disposal Area, Galveston, Texas on 1/21/76

	Trawl 1						Trawl 2					
	S. civitatus	*S. civitatus*	*S. civitatus*	*S. civitatus*	*S. civitatus*	*S. civitatus*	*S. civitatus*	*S. civitatus*	*S. civitatus*	*S. civitatus*	*S. civitatus*	*L. xanthurus*
Percent full	50	50	50	50	T	E	F	50	T	E	E	F
PERCENT COMPOSITION												
Detritus			50	50	T			50	T			
Unk. animal tissue	100		50									
NUMERICAL COMPOSITION												
Prionospio pinnata		1										
Acetes americanus		25										
Labidocera aestiva												1
Ectinosoma sp.												58
Elphidium gunterii												8
Armandia agilis												1
Ampelisca abdita							2					
Unk. amphipod		1										
Phyllodocidae		2										
Unk. polychaete				2			2					12
Mulinia lateralis							1	1				25
Unk. ostracod												17
Unk. nematode												10
Sthenelais boa												1

Table G47 (concluded)

Trawl 3

Percent full	
PERCENT COMPOSITION	
Detritus	No Fish Selected
Unk. animal tissue	
NUMERICAL COMPOSITION	
Prionospio pinnata	
Acetes americanus	
Labodicera aestiva	
Ectinosoma sp.	
Elphidium gunterii	
Armandia agilis	
Ampelisca abdita	
Unk. amphipod	
Phyllodocidat	
Unk. polychaete	
Mulinia lateralis	
Unk. ostracod	
Unk. nematode	
Sthenelais boa	

Table G48

Stomach Contents of Selected Fishes Collected at Station T12 in the Offshore Disposal Area, Galveston, Texas on 1/20/76

	Trawl 1									Trawl 2									
	S. civitatus	*S. civitatus*	*S. civitatus*	*S. civitatus*	*S. civitatus*	*S. civitatus*	*S. civitatus*	*S. civitatus*	*C. arenarius*	*S. civitatus*	*S. civitatus*	*S. civitatus*	*S. civitatus*	*S. civitatus*	*S. civitatus*	*S. civitatus*	*S. civitatus*	*C. arenarius*	*C. arenarius*
Percent full	25	25	25	E	E	E	E	E	F	F	50	50	25	25	25	25	25	F	25
PERCENT COMPOSITION																			
Detritus	50															100			
Unk. animal tissue														100			100	100	50
Unk. shrimp or crab tis.															100				
NUMERICAL COMPOSITION																			
Nereis succinea										2									
Diopatra cuprea													1						
Labidocera aestiva																			2
Pinnixa cristata											3	1							
Ampelisca abdita	1		1																
Unk. polychaete		1																	
Unk. ostracod																			1
Phyllodocidae																			
Acanthocephala																			

Table G48 (concluded)

Trawl 3

	S. civitatus	*S. civitatus*	*S. civitatus*	*S. civitatus*	*S. civitatus*	*S. civitatus*	*S. civitatus*	*S. civitatus*	*L. xanthurus*	*S. lanceolatus*
Percent full	F	50	50	T	T	E	E	E	F	E
PERCENT COMPOSITION										
Detritus	50			T	T					
Unk. animal tissue										
Unk. shrimp or crab tis.										
NUMERICAL COMPOSITION										
Nereis succinea										
Diopatra cuprea	1									
Labidocera aestiva										
Pinnixa cristata		2								
Ampelisca abdita										
Unk. polychaete										
Unk. fish										
Unk. ostracod										
Phyllodocidae		1	2							
Acanthocephala									37	

Table G49

Stomach Contents of Selected Fishes Collected at Station T15 in the Offshore

Disposal Area, Galveston, Texas on 3/11/76

	Trawl 1										Trawl 2									
	M. undulatus	*M. undulatus*	*M. undulatus*	*M. undulatus*	*M. undulatus*	*M. undulatus*	*M. undulatus*	*M. undulatus*	*C. arenarius*	*C. arenarius*	*S. civitatus*	*M. undulatus*	*M. undulatus*	*M. undulatus*	*M. undulatus*	*M. undulatus*	*M. undulatus*	*C. arenarius*	*C. arenarius*	*L. fasciatus*
Percent full	F	F	F	F	F	F	50	E	25	25	F	F	F	50	50	25	25	F	12	12
PERCENT COMPOSITION																				
Detritus			20	20		10	15				50		50	40	100	100	50			
Unk. animal tissue			20	20									25	20						
Unk. crustacean tissue		25																		
NUMERICAL COMPOSITION																				
Prionospio pinnata	2			9	4	2						2	1							
Acetes americanus									1											
Nereis succinea				1																
Notomastus hemipodus						1														
Labidocera aestiva		1							3	3								9	3	
Stegocephalinidae												1								
Larval sciaenids		1																		
Pinnixa cristata			1											1						
Balanoglossus sp.																				
Aglaophamus verrilli			1							1										
Lepidasthenia sp.			1																	

Table G49 (continued)

Trawl 3

	M. undulatus	*M. undulatus*	*M. undulatus*	*M. undulatus*	*M. undulatus*	*M. undulatus*	*M. undulatus*	*M. undulatus*	*C. arenarius*	*C. arenarius*
Percent full	F	F	F	F	F	F	F	E	F	F
PERCENT COMPOSITION										
Detritus			50				50			
Unk. animal tissue	100		40		50		50			
Unk. crustacean tissue										
NUMERICAL COMPOSITION										
Prionospio pinnata		4		6	6					
Acetes americanus										
Nereis succinea										
Notomastus hemipodus										
Labidocera aestiva			1						10	9
Stegocephalidae										
Larval sciaenids										
Pinnixa cristata										
Balanoglossus sp.				2						
Aglaophamus verrilli										
Lepidasthenia sp.										

Table G49 (continued)

	Trawl 1										Trawl 2									
	M. undulatus	*M. undulatus*	*M. undulatus*	*M. undulatus*	*M. undulatus*	*M. undulatus*	*M. undulatus*	*M. undulatus*	*C. arenarius*	*C. arenarius*	*S. civitatus*	*M. undulatus*	*M. undulatus*	*M. undulatus*	*M. undulatus*	*M. undulatus*	*M. undulatus*	*C. arenarius*	*C. arenarius*	*L. fasciatus*
NUMERICAL COMPOSITION (continued)																				
Unk. xanthid				1			2				1							2		
Unk. shrimp					1															
Unk. polychaete						4	4													
Megalops larva																	1		1	1
Unk. crustacean																		3		
Unk. amphipod																				
Callinectes sapidus																				
Diopatra cuprea																				

Table G49 (concluded)

Trawl 3

	M. undulatus	*M. undulatus*	*M. undulatus*	*M. undulatus*	*M. undulatus*	*M. undulatus*	*M. undulatus*	*M. undulatus*	*C. arenarius*	*C. arenarius*
NUMERICAL COMPOSITION (continued)										
Unk. xanthid		1							1	4
unk. polychaete										
Megalops larva										
Unk. crustacean										
Unk. amphipod		1								
Callinectes sapidus				1						
Diopatra cuprea						1				

Table G50

Stomach Contents of Selected Fishes Collected at Station T12 in the Offshore Disposal Area, Galveston, Texas on 3/11/76

	Trawl 1										Trawl 2
	S. civitatus	*S. civitatus*	*M. undulatus*	*M. undulatus*	*M. undulatus*	*M. undulatus*	*C. arenarius*	*C. arenarius*	*C. arenarius*	*C. arenarius*	
Percent full	25	E	F	F	50	25	F	50	25	E	
PERCENT COMPOSITION											
Detritus	50		50		50						No Fish Selected
Unk. animal tissue					50						
NUMERICAL COMPOSITION											
Prionospio pinnata				1		2			3		
Acetes americanus							3		1		
Nereis succinea				1							
Diopatra cuprea							1				
Glycera americana				1							
Labidocera aestiva				2							
Notomastus hemipodus											
Larval sciaenids											
Pinnixa cristata											
Megalops larva	1										
Unk. amphipod			3								
Lepidasthenia sp.				1							

Table G50 (continued)

Trawl 3

	S. civitatus	*S. civitatus*	*M. undulatus*	*M. undulatus*	*M. undulatus*	*C. arenarius*	*C. arenarius*	*C. arenarius*	*C. arenarius*	*C. arenarius*
Percent full	E	E	F	50	25	F	F	50	50	12
PERCENT COMPOSITION										
Detritus			50	50	50					
Unk. animal tissue				50	50					
NUMERICAL COMPOSITION										
Prionospio pinnata										
Acetes americanus						2		1	1	1
Nereis succinea										
Diopatra cuprea										
Glycera americana										
Labidocera aestiva							1			
Notomastus hemipodus			2							
Larval sciaenids									1	
Pinnixa cristata									1	
Megalops larva										
Unk. amphipod						1			1	
Lepidasthenia sp.										

Table G50 (continued)

	Trawl 1										Trawl 2
	S. civitatus	*S. civitatus*	*M. undulatus*	*M. undulatus*	*M. undulatus*	*M. undulatus*	*C. arenarius*	*C. arenarius*	*C. arenarius*	*C. arenarius*	
NUMERICAL COMPOSITION (continued)											
Mysidopsis sp.				1							
Unk. shrimp								1			

Table G50 (concluded)

Trawl 3

	S. civitatus	*S. civitatus*	*M. undulatus*	*M. undulatus*	*M. undulatus*	*C. arenarius*	*C. arenarius*	*C. arenarius*	*C. arenarius*	*C. arenarius*
NUMERICAL COMPOSITION (continued)										
Mysidopsis sp.										
Unk. shrimp							2			

Table G51

Stomach Contents of Selected Fishes Collected at Station T2 in the Offshore

Disposal Area, Galveston, Texas on 5/13/76

	Trawl 1										Trawl 2									
	M. undulatus	*M. undulatus*	*M. undulatus*	*M. undulatus*	*P. octonemus*	*P. octonemus*	*P. octonemus*	*C. arenarius*	*C. arenarius*	*L. xanthurus*	*C. arenarius*	*C. arenarius*	*P. octonemus*	*P. octonemus*	*P. octonemus*	*M. undulatus*	*M. undulatus*	*M. undulatus*	*M. undulatus*	*M. undulatus*
Percent full	25	25	5	T	F	F	25	F	F	F	F	50	F	F	E	50	25	25	25	E
PERCENT COMPOSITION																				
Detritus		50				50				50						95				
Unk. animal tissue	100	50		T			95				90						100	50		
NUMERICAL COMPOSITION																				
Prionospio pinnata											1									
Acetes americanus					1	1		8	2											
Megalops larva							1													
Ectinosoma sp.										24			220							
Pinnixa cristata							1													
Balanoglossus sp.		1								1										
Labidocera aestiva													7	48		1				
Unk. Xanthid								1			1									
Ampelisca abdita																		2		
Anaitides erythrophyllus										3										
Diatoms										476										
Unk. polychaete										3										

Table G51 (continued)

	Trawl 1										Trawl 2									
	M. undulatus	*M. undulatus*	*M. undulatus*	*M. undulatus*	*P. octonemus*	*P. octonemus*	*P. octonemus*	*C. arenarius*	*C. arenarius*	*L. xanthurus*	*C. arenarius*	*C. arenarius*	*P. octonemus*	*P. octonemus*	*P. octonemus*	*M. undulatus*	*M. undulatus*	*M. undulatus*	*M. undulatus*	*M. undulatus*
NUMERICAL COMPOSITION (continued)																				
Unk. nematode										47										
Mulinia lateralis										10										
Corophium acherusicum											1									
Unk. shrimp												4							1	
Sagitta tenuis													1							
Capitellidae																				
Unk. crustacean																				
Plastic beads																				
Anchoa mitchelli																				

Table G51 (continued)

Trawl 3

	M. undulatus	*M. undulatus*	*M. undulatus*	*M. undulatus*	*P. octonemus*	*P. octonemus*	*P. octonemus*	*P. octonemus*	*C. arenarius*	*C. arenarius*
Percent full	50	25	E	E	F	F	50	E	F	F
PERCENT COMPOSITION										
Detritus	50									
Unk. animal tissue	50				30					
NUMERICAL COMPOSITION										
Prionospio pinnata										
Acetes americanus					1	2				1
Megalops larva										
Echinostoma sp.										
Pinnixa cristata										
Balanoglossus sp.										
Labidocera aestiva					2	2				
Unk. Xanthid										
Ampelisca abdita					4					
Anaitides erythrophyllus										
Diatoms										
Unk. polychaete										

Table G51 (concluded)

Trawl 3

	M. undulatus	*M. undulatus*	*M. undulatus*	*M. undulatus*	*P. octonemus*	*P. octonemus*	*P. octonemus*	*P. octonemus*	*C. arenarius*	*C. arenarius*
NUMERICAL COMPOSITION (continued)										
Unk. nematode										
Mulinia lateralis										
Corophium acherusicum										
Unk. shrimp							1			1
Sagitta tenuis										
Capitellidae		1								
Unk. crustacean					1					
Plastic beads									6	
Anchoa mitchelli									1	

Table G52

Stomach Contents of Selected Fishes Collected at Station T15 in the Offshore Disposal Area, Galveston, Texas on 5/13/76

	Trawl 1										Trawl 2									
	P. octonemus	*P. octonemus*	*P. octonemus*	*P. octonemus*	*P. octonemus*	*M. undulatus*	*M. undulatus*	*M. undulatus*	*M. undulatus*	*M. undulatus*	*M. undulatus*	*M. undulatus*	*M. undulatus*	*M. undulatus*	*M. undulatus*	*P. octonemus*	*P. octonemus*	*P. octonemus*	*P. octonemus*	*P. octonemus*
Percent full	5	T	E	E	E	F	F	75	75	50	F	F	50	25	E	50	25	T	T	E
PERCENT COMPOSITION																				
Detritus		T							20	40				50				T		
Unk. animal tissue										60									T	
Unk. crustacean tissue								60			100									
Sand								40												
NUMERICAL COMPOSITION																				
Diopatra cuprea							1		1			1	1							
Unk. nematode	1																			
Glycinde solitaria									1											
Labidocera aestiva																112				
Unk. xanthid						1														
Balanoglossus sp.									1					1						
Unk. amphipod									1											
Unk. copepod																9				

Table G52 (concluded)

Trawl 3

	M. undulatus	*M. undulatus*	*M. undulatus*	*M. undulatus*	*M. undulatus*	*P. octonemus*	*P. octonemus*	*P. octonemus*	*P. octonemus*	*C. arenarius*
Percent full	F	F	50	25	E	F	F	E	E	E
PERCENT COMPOSITION										
Detritus				50						
Unk. animal tissue				50			30			
Sand										
NUMERICAL COMPOSITION										
Diopatra cuprea	1	1	1							
Unk. nematode										
Glycinde solitaria										
Labidocera aestiva						3	20			
Unk. xanthid										
Balanoglossus sp.										
Unk. amphipod										
Unk. copepod										

Table G53

Stomach Contents of Selected Fishes Collected at Station T12 in the Offshore

Disposal Area, Galveston, Texas on 5/13/76

	Trawl 1										Trawl 2									
	M. undulatus	*M. undulatus*	*M. undulatus*	*P. octonemus*	*P. octonemus*	*P. octonemus*	*P. octonemus*	*P. octonemus*	*C. arenarius*	*C. arenarius*	*M. undulatus*	*M. undulatus*	*M. undulatus*	*P. octonemus*	*P. octonemus*	*P. octonemus*	*P. octonemus*	*S. civitatus*	*C. arenarius*	*C. arenarius*
Percent full	F	F	F	F	F	25	25	E	F	F	F	F	F	F	F	F	E	T	F	E
PERCENT COMPOSITION																				
Detritus											20	20								
Unk. animal tussue		25			20	90							40	30				T		
Unk. shrimp tissue																			100	
NUMERICAL COMPOSITION																				
Prionospio pinnata		1	2									1								
Acetes americanus									2											
Diopatra cuprea				1								1								
Glycinde solitaria												1	1							
Labidocera aestiva									2											
Unk. nematode						1														
Armandia agilis												1	3							
Pinnixa cristata									1											
Balanoglossus sp.	1	2	1	1	5		1				2	1	3	2	1	3				
Ampelisca abdita				1																
Unk. shrimp										1										

Table G53 (continued)

Trawl 3

	M. undulatus	*M. undulatus*	*M. undulatus*	*P. octonemus*	*P. octonemus*	*P. octonemus*	*P. octonemus*	*P. octonemus*	*C. arenarius*	*C. arenarius*
Percent full	F	F	F	F	F	F	E	E	F	E
PERCENT COMPOSITION										
Detritus	10									
Unk. animal tissue				30						
Unk. shrimp tissue										
NUMERICAL COMPOSITION										
Prionospio pinnata		1								
Acetes americanus										
Diopatra cuprea										
Glycinde solitaria										
Labidocera aestiva										
Unk. nematode										
Armandia agilis					4					
Pinnixa cristata						2				
Balanoglussus sp.	5	1		2						
Ampelisca abdita	1									
Unk. shrimp			1						1	

Table G53 (continued)

	Trawl 1										Trawl 2									
	M. undulatus	*M. undulatus*	*M. undulatus*	*P. octonemus*	*P. octonemus*	*P. octonemus*	*P. octonemus*	*P. octonemus*	*C. arenarius*	*C. arenarius*	*M. undulatus*	*M. undulatus*	*M. undulatus*	*P. octonemus*	*P. octonemus*	*P. octonemus*	*P. octonemus*	*S. civitatus*	*C. arenarius*	*C. arenarius*
NUMERICAL COMPOSITION (continued)																				
Lumbrineris tenuis				1						1		1								
Megalops larva												1								
Pseudeurythoe ambigua														1						
Unk. polychaete															1					
Mysidopsis sp.																				
Corophium acherusicum																				
Anaitides erythrophyllus																				
Unk. fish																				

Table G53 (concluded)

Trawl 3

NUMERICAL COMPOSITION (continued)	*M. undulatus*	*M. undulatus*	*M. undulatus*	*P. octonemus*	*P. octonemus*	*P. octonemus*	*P. octonemus*	*P. octonemus*	*C. arenarius*	*C. arenarius*
Lumbrineris tenuis		2								
Megalops larva										
Pseudeurythoe ambigua										
Unk. polychaete										
Mysidopsis sp.		1								
Corophium acherusicum				1						
Anaitides erythrophyllus					1					
Unk. fish									2	

Table G54

Stomach Contents of Selected Fishes Collected at Station T14 in the Offshore

Disposal Area, Galveston, Texas on 5/13/76

	Trawl 1									Trawl 2									
	S. civitatus	*S. civitatus*	*S. civitatus*	*S. civitatus*	*P. rubio*	*P. rubio*	*P. octonemus*	*P. octonemus*	*P. octonemus*	*M. undulatus*	*S. civitatus*	*S. civitatus*	*P. octonemus*	*P. octonemus*	*P. octonemus*	*P. octonemus*	*P. octonemus*	*P. octonemus*	*P. octonemus*
Percent full	E	E	E	E	F	F	F	F	F	F	F	W	F	F	F	75	50	20	E
PERCENT COMPOSITION																			
Detritus														20		20		10	
Unk. animal tissue																	5		
Unk. crustacean tissue																			
NUMERICAL COMPOSITION																			
Prionospio pinnata														3					
Trachypeneus similis						1													
Diopatra cuprea										2									
Nereis succinea															1				
Unk. polychaete														1					
Glycinde solitaria														1					
Sicyonia dorsalis					1														
Armandia agilis														1					
Pinnixa cristata					5		2	3						1			1		
Balanoglossus sp.							2		1	4	1		1	4	1	1			
Ampelisca abdita							2		2					9	2	10	3	2	

Table G54 (continued)

<u>Trawl 3</u>

	P. octonemus	*P. octonemus*	*P. rubio*	*P. rubio*	*S. civitatus*	*S. civitatus*	*S. civitatus*	*S. civitatus*	*S. civitatus*	*S. civitatus*
Percent full	50	25	F	75	T	E	E	E	E	E
PERCENT COMPOSITION										
Detritus		40	10		T					
Unk. animal tissue										
Unk. crustacean tissue				50						
NUMERICAL COMPOSITION										
Prionospio pinnata	3									
Trachypeneus similis										
Diopatra cuprea										
Nereis succinea										
Unk. polychaete										
Glycinde solitaria										
Sicyonia dorsalis										
Armandia agilis		1								
Pinnixa cristata		1	2							
Balanoglossus sp.										
Ampelisca abdita	5	2								

Table G54 (concluded)

Trawl 3

	P. octonemus	*P. octonemus*	*P. rubio*	*P. rubio*	*S. civitatus*	*S. civitatus*	*S. civitatus*	*S. civitatus*	*S. civitatus*	*S. civitatus*
NUMERICAL COMPOSITION (continued)										
Unk. copepod										
Megalops larva			1							
Mysidopsis sp.			11	3						
Unk. crustacean										
Unk. amphipod										
Lumbrineris tenuis										
Corophium acherusicum										

Table G54 (continued)

	Trawl 1									Trawl 2									
	S. civitatus	*S. civitatus*	*S. civitatus*	*S. civitatus*	*P. rubio*	*P. rubio*	*P. octonemus*	*P. octonemus*	*P. octonemus*	*M. undulatus*	*S. civitatus*	*S. civitatus*	*P. octonemus*	*P. octonemus*	*P. octonemus*	*P. octonemus*	*P. octonemus*	*P. octonemus*	*P. octonemus*
NUMERICAL COMPOSITION (continued)																			
Unk. copepod															1				
Megalops larva					1														
Mysidopsis sp.							1							1					
Unk. crustacean									1										
Unk. amphipod														2		2			
Lumbrineris tenuis														1					
Corophium acherusicum															2			1	

Table G55

Stomach Contents of Selected Fishes Collected at Station T27 in the Offshore Disposal Area, Galveston, Texas on 5/13/76

	Trawl 1										Trawl 2				
	P. octonemus	*P. octonemus*	*P. octonemus*	*P. octonemus*	*P. octonemus*	*P. octonemus*	*P. octonemus*	*P. octonemus*	*P. octonemus*	*P. octonemus*	*S. civitatus*	*S. civitatus*	*P. octonemus*	*P. octonemus*	*M. undulatus*
Percent full	F	F	F	F	F	50	25	E	E	E	F	E	F	75	F
PERCENT COMPOSITION															
Detritus	30		40		20						30				
Unk. animal tissue	30			10			100							50	
NUMERICAL COMPOSITION															
Prionospio pinnata			1		1								3		
Acetes americanus					1										
Diopatra cuprea		1			1										
Mysidopsis sp.		1		1		1									1
Labidocera aestiva	2	2												1	2
Unk. xanthid	1	1													
Armandia agilis			2												
Pinnixa cristata	2	2		5										1	
Balanoglossus sp.			8		6										
Ampelisca abdita	1	2		1		1									
Megalops larva			1												
Unk. polychaete						1									

(111)

Table G55 (continued)

Trawl 3

	S. civitatus	*S. civitatus*	*S. civitatus*	*P. octonemus*	*P. octonemus*	*P. octonemus*	*P. octonemus*	*P. octonemus*	*P. octonemus*	*P. octonemus*
Percent full	F	E	E	F	F	F	50	50	25	25
PERCENT COMPOSITION										
Detritus	30						20	30	50	
Unk. animal tissue				100		95	75	50	50	80
NUMERICAL COMPOSITION										
Prionospio pinnata								1		
Acetes americanus										
Diopatra cuprea										
Mysidopsis sp.										
Labidocera aestiva										
Unk. xanthid										
Armandia agilis										
Pinnixa cristata					1					
Balanoglossus sp.					2					1
Ampelisca abdita										
Megalops larva										
Unk. polychaete					1					

Table G55 (concluded)

	S. civitatus	*S. civitatus*	*S. civitatus*	*P. octonemus*	*P. octonemus*	*P. octonemus*	*P. octonemus*	*P. octonemus*	*P. octonemus*	*P. octonemus*
NUMERICAL COMPOSITION (continued)										
Mulinia lateralis	7									
Corophium acherusicum										
Lumbrineris tenuis										
Unk. amphipod	1									
Unk. gastropod	1									
Unk. shrimp					1					
Anaitides erythrophyllus							1			

(2.14)

Table G55 (continued)

	Trawl 1										Trawl 2					
	P. octonemus	*P. octonemus*	*P. octonemus*	*P. octonemus*	*P. octonemus*	*P. octonemus*	*P. octonemus*	*P. octonemus*	*P. octonemus*	*P. octonemus*	*S. civitatus*	*S. civitatus*	*P. octonemus*	*P. octonemus*	*P. octonemus*	*M. undulatus*
NUMERICAL COMPOSITION (continued)																
Mulinia lateralis											8					
Corophium acherusicum															3	
Lumbrineris tenuis															1	
Unk. amphipod																
Unk. gastropod																
Unk. shrimp																
Anaitides erythrophyllus																

APPENDIX H

RAW ZOOPLANKTON DATA FROM THE EXPERIMENTAL STUDY

Table H1. Meroplankton data from the National Marine Fisheries Service archived zooplankton samples collected at station W53 between 11 March 1963 and 2 June 1965. Data are the numbers of individuals of each taxon per m^3 of water filtered.

					1963						1964		
	3/11	3/26	5/7	5/13	7/1	8/27	10/1	10/30	11/29	1/25	3/17	4/14	5/21
Cnidaria													
Hydromedusa I	144.6	1.8									157.7	77.3	
Hydromedusa II		0.9											
Hydromedusa III		0.9			0.2								
Hydromedusa IV			3.9	13.5			6.2						0.2
Bougainvillia sp.				0.1									
Liriope sp. I.							0.1						
Turbellaria													
Polycladida			0.2	0.4	0.2								
Annelida - Polychaeta													
Polychaete larva A	10.2	6.2	19.4	0.1	7.7	1.8	2.3		0.4	4.6	1.4	4.9	4.6
Polychaete larva 2	1.3												
Polychaete larva 5		0.9											
Polychaete larva 6		0.9											
Polychaete larva 7			0.1	0.2	0.1								
Polychaete larva 8			19.4		0.1		0.1		P				0.6
Polychaete larva 9					0.3		0.8						
Polychaete larva 10										0.2			1.0
Polychaete larva 13													
Nereidae larva			0.1									4.8	0.2
Phyllodocidae larva			0.1										
Larvae unID									0.1				
Scale worm larva													
Nephtys sp. larva													

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Table H1. (continued)

	1964								1965			
	6/24	7/15	8/28	9/24	10/27	11/18	12/19	1/6	2/25	3/20	4/22	6/22
Cnidaria						FLOW METER DATA NOT RECORDED						
Hydromedusa I	7.1		2.4	4.3	2.1				45.5	42.7		
Hydromedusa II												
Hydromedusa III												
Hydromedusa IV				2.1								
Bougainvillia sp.			0.1	0.5					11.4	0.2		
Liriope sp. I.	1.8			2.1	39.9				0.1			
Turbellaria												
Polycladida												
Annelida - Polychaeta												
Polychaete larva A	12.4	10.7	0.1	64.0	6.3		0.1	0.6	22.8	156.4		
Polychaete larva 2												
Polychaete larva 5										21.3		
Polychaete larva 6									P			
Polychaete larva 7									P			
Polychaete larva 8											0.4	
Polychaete larva 9												
Polychaete larva 10	0.1	0.1										
Polychaete 13				0.5								
Nereidae larva												
Phyllococidae larva												
Larvae unID		67.6							5.7			
Scale worm larva		1.8	1.2		2.1				0.1		0.2	
Nephtys sp. larva									P			

Table H1. (continued)

	1963									1964			
	3/11	3/26	5/7	5/13	7/1	8/27	10/1	10/30	11/29	1/25	3/17	4/14	5/21
Mollusca													
Gastropod larvae		1.8	34.9	0.5	20.5	94.2			P		0.5	4.8	65.4
Bivalve larvae	7.7	0.9	19.4	32.0	617.0	49.4	4.7	6.1	2.9	0.1		14.5	217.9
Immature cephalopod													
Arthropoda - Crustacea													
Cirripedia													
nauplii larvae	185.6	44.4	7.8	2.5			0.1			8.4	2.7	24.2	174.3
cypris larva	14.1	27.6	3.9	42.2	0.2		4.7			7.4	77.7	198.0	43.6
Stomatopoda													
pseudozoea larva			0.1	P	0.4	0.9							0.1
Mysidacea													
immature	0.1		0.1	0.3			0.1		P				
Mysidopsis bigelowi				0.3									
Mysis sp. I													
Promysis atlantica													
Cumacea			0.3	2.0									
Amphipoda													
Gammaridea	0.1			0.5									
Corophium sp.												0.3	
Isopoda													0.1
Valvifera			0.1										
Copepoda													
Caligoida													
Caligus sp.								P					0.9
Caligus metanauplius				0.3									
Decapoda													
Pinnixa zoea			3.9	0.3	2.6	0.1	3.1	6.1	0.1			0.2	1.1
Pinnotheres zoea			0.4		2.6	14.6	0.1	0.2					
Latreutes zoea			0.3	0.3	0.2	0.9		0.1					0.1
Callinectes zoea			0.1										1.2

Table H1. (continued)

	6/24	7/15	8/28	1964 9/24	10/27	11/18	12/19	1/6	2/25	1965 3/20	4/22	6/2
Mollusca												
Gastropod larvae	17.8	7.1	8.5	42.7	8.4			2.8	45.5	782.2	293.9	3.4
Bivalve larvae	51.6	42.7	45.9	61.9	211.9		3.8	0.8	45.5	64.0	2365.6	43.7
Immature cephalopod	0.1											
Arthropoda - Crustacea												
Cirripedia												
nauplii larva				17.1	10.5		97.9	38.6	398.2	5895.1	85.3	1.0
cypris larva	35.6			10.7	2.1			51.0	199.1	199.1	37.9	62.4
Stomatopoda												
pseudozoea larva			8.5			FLOW METER DATA NOT RECORDED						
Mysidacea												
immature										0.1		
Mysidopsis bigelowi									0.7			
Mysis sp. I					0.1				0.1			
Promysis atlantica					0.1				0.4	0.1		
Cumacea									5.7	0.2		
Amphipoda												
Gammaridea	3.6		0.1		2.1				11.4	0.6		
Corophium sp.												
Isopoda												
Valvifera	1.7		1.2		2.1				0.1			
Copepoda												
Caligoida												
Caligus sp.								P			0.1	
Caligus metanauplius				4.3							3.1	
Decapoda												
Pinnixa zoea			1.2	12.8	4.2		0.1				0.3	1.3
Pinnotheres zoea			3.6		2.1							0.3
Latreutes zoea			0.3	4.3							0.2	
Callinectes zoea				0.1							0.7	0.5

Table H1. (continued)

	1963									1964			
	3/11	3/26	5/7	5/13	7/1	8/27	10/1	10/30	11/29	1/25	3/17	4/14	5/21
Decapoda (con'd)													
Callianassa zoea					0.2	0.1	0.8						0.1
Callianassa zoea II			0.1	0.3	0.2								0.1
Alpheidae zoea						0.1		P					0.2
Paguridae zoea	0.1	0.9	0.1	0.8	2.6	0.1		0.6	0.1				0.1
Portunidae zoea					0.1	1.8	0.8						
Xanthidae zoea				2.3			1.6	0.1				9.7	43.6
Xanthidae zoea I			0.2	P	0.2								
Callinectes megalops	1.3												
Upogebia zoea			0.2	0.1	0.2	4.6	0.8	P					21.8
Paguridae glaucothoe			0.1		0.2					0.1			
Decapoda megalops			0.1	P	0.3	0.2	0.2						2.2
Lepidopa zoea			0.1	P									
Anomura zoea I			0.5	0.8	1.6	2.7							0.9
Trachypeneus-Xiphopeneus larva			1.3	P	0.7		1.3						0.5
Porcellanidae zoea				P				P					0.1
Palaemonetes zoea				0.3				P				0.1	
Ogyrides zoea				0.3				0.1					0.3
Penaeus larva					0.2								0.2
Decapoda zoea II						0.1							
Decapoda zoea III							0.8						
Caridea zoea							0.1						
Ogyrides zoea (Form A)							0.2						
Penaeus P.L.												0.4	0.1
Decapoda zoea IV													
Penaeus mysid													
Caridea zoea													
Caridea zoea III													
Penaeus aztecus P.L.													

Table H1. (continued)

	1964								1965			
	6/24	7/15	8/28	9/24	10/27	11/18	12/19	1/6	2/25	3/20	4/22	6/2
Decapoda (con'd)						FLOW METER DATA NOT RECORDED						
Callianassa zoea		3.6	1.2	0.8								
Callianassa zoea II			0.1	0.1								0.1
Alpheidae zoea		0.2		0.6								0.1
Paguridae zoea	1.8	3.6	1.2	32.0						0.4	4.7	0.3
Portunidae zoea			0.1	2.1				P				0.1
Xanthidae zoea	1.8	0.3		6.4							0.4	6.2
Xanthidae zoea I												
Callinectes megalops			2.4	0.4			0.1					
Upogebia zoea			1.2	4.3								0.3
Paguridae glaucothoe									0.1	0.1		
Decapoda megalops		0.2	2.4	2.1	0.3							0.4
Lepidopa zoea												
Anomura zoea I	1.8		10.9	2.1								
Trachypeneus-Xiphopeneus larva		3.3	P	0.7	0.1							
Porcellanidae zoea		0.1	3.6	8.5					0.2	0.1		
Palaemonetes zoea		0.4										
Ogyrides zoea			6.0	0.3	0.1							0.1
Penaeus larva		0.1	P	6.5								
Decapoda zoea II												
Decapoda zoea III					2.1							
Caridea zoea												
Ogyrides zoea (Form A)												
Penaeus P.L.			p	0.1					P	0.1		
Decapoda zoea IV	0.1											
Penaeus mysid		0.1										
Caridea zoea			0.1									
Caridea zoea III					0.1						0.2	
Penaeus aztecus P.L.										0.1		

Table H1. (continued)

	1963									1964			
	3/11	3/26	5/7	5/13	7/1	8/27	10/1	10/30	11/29	1/25	3/17	4/14	5/21
Phoronida													
Actinotroch larva	1.3								P			14.5	
Echinodermata													
unID larva		0.1											
Pluteus larva													435.7
Chordata													
postlarval fish												4.8	0.3
eggs					10.2	37.5	0.4	0.3			0.4	4.8	2.4
larva		6.2	0.8	0.5	0.3	5.5	2.3	0.5					
UnID larva	0.3	1.8	0.1						1.3				

Table H1. (continued

	1964								1965			
	6/24	7/15	8/28	9/24	10/27	11/18	12/19	1/6	2/25	3/20	4/22	6/22
Phoronida						FLOW METER DATA NOT RECORDED						
actinotroch larva					4.2				5.7	49.8	0.2	
Echinodermata												
UnID larva												
Pluteus larva			13.3	25.6								
Chordata												
post larval fish	5.3		0.1						0.4	7.1	4.7	9.4
eggs	3.6	3.5	2.4	1.1	0.3				0.2	14.2	0.2	0.1
UnID larva												

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Table H 2 . Holoplankton data from the National Marine Fisheries Service archived zooplankton samples collected at station W53 between 11 March 1963 and 2 June 1965. Data are the number of individuals of each taxon per m^3 of water filtered.

					1963						1964		
	3/11	3/26	5/7	5/13	7/1	8/27	10/1	10/30	11/29	1/25	3/17	4/14	5/21
Protozoa													
Noctiluca scintillans	2.6										713.6		
Cnidaria													
Siphonophora	1.3	6.2	0.5		7.7				P				
Medusa			3.9						0.1				
Medusa I				0.1									
Siphonophore sp. I							0.8						
Nemopsis bachei										0.4			
Ctenophora													
Beroe ovata				P							0.1		
Polychaeta													
Tomopteris sp.													
Sagitella sp.													
Mollusca													
Creseis sp.		0.9											
Arthropoda - Crustacea													
Cladocera													
Penilia sp.		4.4	1260.6	0.3	23.0								
Podon sp.		31.1			5.1								21.8
Ostracoda													
Euconchoecia sp.	5.1	0.9	3.9						0.2	0.1	0.1		

Table H2. (continued)

	1964								1965			
	6/24	7/15	8/28	9/24	10/27	11/18	12/19	1/6	2/25	3/20	4/22	6/2
Protozoa												
Noctiluca scintillans												
Cnidaria												
Siphonophora	0.1				4.2	FLOW METER DATA NOT RECORDED			0.3	0.1	4.7	
Medusa	3.6		2.4	4.3	2.1			P				
Medusa I			0.3	2.1	0.1							
Siphonophore sp. I												
Nemopsis bachei							0.4					
Ctenophora												
Beroe ovata					0.1							
Polychaeta												
Tomopteris sp.	0.1											
Sagitella sp.	0.1		0.1		0.1							
Mollusca												
Creseis sp.	1.8	0.2		0.1								
Arthropoda - Crustacea												
Cladocera												
Penilia sp.												
Podon sp.		10.7						0.3				
Ostracoda												
Euconochoecia sp.												

Table H2. (continued)

	1964								1965				
	5/21	6/24	7/15	8/28	9/24	10/27	11/18	12/19	1/6	2/25	3/20	4/22	6/2
Copepoda													
copepepod nauplii	239.6	28.4	99.6	6.0	138.7	58.8	FLOW METER DATA NOT RECORDED	60.2	10.5	79.6	21.3	9.5	37.5
Calanoida													
copepodites	8846.0	540.4	696.8	288.6	2702.9	902.3		508.2	208.9	1462.0	3143.0	483.6	384.0
Acartia tonsa	4422.8	104.8	384.0	16.9	219.7	71.2		176.9	2.5	45.4		109.0	1030.3
Acartia lilljeborgi			25.0	113.5	93.9	230.8							
Paracalanus crassirostris	108.9	256.0	32.0	76.0	140.8	337.8		839.5	94.0	2265.1	1493.3	85.3	25.0
Paracalanus indicus	65.4	245.3	71.1	2.4		29.4			1.7	182.0	135.1	33.2	6.2
Paracalanus quasimodo	130.7	12.4	10.7		4.3				0.8	142.2	85.3		9.4
Labidocera aestiva	18.8		3.6	1.2	4.3	2.1		0.9		34.1	0.1	9.5	9.4
Centropages hamatus								56.4	0.2	301.5	874.7		
Temora turbinata	21.8	48.0	10.7	22.9	78.9	115.4				5.7	42.6		
Temora stylifera	0.2	0.1											
Candacia curta													
Calanopia americana				12.0									
Clausocalanus furcatus													
Eucalanus pileatus	21.8	69.3	3.6	4.8	P	1.4			P		0.6	0.2	0.1
Labidocera scotti				1.2									
Centropages velificatus	21.8	3.5	35.6	1.2	23.5	2.1					0.1	4.7	0.4
Lucicutia flavicornis													
Pontella meadii													
Clausocalanus jobei													
Pseudodiaptomus sp. I													
Eucalanus monachus													
Eucalanus aculeatus		3.5											
Tartanus setacaudatus			3.6	1.2	2.1								
Pontellopsis villosa					P								
Euchaetas marina											0.1		
Euchaetas paraconcinna											0.1		

Table H 2. (continued

	1963									1964		
	3/11	3/26	5/7	5/13	7/1	8/7	10/1	10/30	11/29	1/25	3/17	4/14
Copepoda												
copepod nauplii	12.8	13.3	131.9	37.3	105.0	24.7	10.9		3.1	2.8	5.0	
Calanoida												
copepodites	889.6	2814.0	1327.0	158.2	888.3	767.1	277.1	2344.0	70.4	530.6	90.1	118.3
Acartia tonsa	43.5	486.2	624.5	29.0	38.4	177.4	122.5	3362.0	10.6	115.0	32.9	5236.0
Acartia lilljeborgi					46.1	126.2	69.5	130.0	1.2			
Paracalanus crassirostris	112.6	491.6	97.0	7.4	145.9	82.3	60.9	92.5	2.0	7.4	17.8	159.4
Paracalanus indicus	0.2	21.3	11.6	2.8	17.9	1.8	0.8	6.2	9.3	2.8	0.5	62.8
Paracalanus quasimodo	0.2	8.9	7.8	0.3	5.1		5.5	6.2	2.6	0.9	0.3	9.7
Labidocera aestiva		0.9	7.8	0.3	41.0	21.9	8.6	61.7	P	0.3		159.4
Centropages hamatus	67.8	264.9			0.3					22.3	6.9	4.8
Temora turbinata	1.3	5.3	15.5	1.8	56.3	0.1	3.9	36.9	3.1	0.9		14.5
Temora stylifera					0.2	0.9						0.1
Candacia curta	1.3											
Calanopia americana			0.1									
Clausocalanus furcatus				0.3								
Eucalanus pileatus				P	1.1		0.1	0.1	0.2		0.1	
Labidocera scotti					0.3	0.3	0.1					
Centropages velificatus					0.1		0.8	61.1	0.2			
Lucicutia flavicornis					2.6							
Pontella meadii					0.1							
Clausocalanus jobei							0.8					
Pseudodiaptomus sp. I.							0.1		P	0.9		
Eucalanus monachus												0.2
Eucalanus aculeatus												
Tartanus setacaudatus												
Pontellopsis villosa												
Euchaetas marina												
Euchaetas paraconcinna												

Table H2. (continued)

	1963									1964			
	3/11	3/26	5/7	5/13	7/1	8/27	10/1	10/30	11/29	1/25	3/17	4/14	5/21
Harpacticoida													
Copepodites	1.3		3.9		7.7		0.8						
Euterpinna acutifrons	6.4	0.9	31.0	7.4	110.1	0.9	0.8	18.5	6.4	0.9	0.1		21.8
Thomsonula hyaena	357.1	3.6									5.9		
Clytemnestra scutellata	0.1												
Ectinosoma sp.	0.1												
Macrosetella gracilis									P				
Cyclopoida													
Copepodites	15.4	0.9	11.6	1.0	64.0	0.9	8.6	49.4	2.0	4.6	0.4		21.8
Oithona nana	7.7		31.0	3.6	576.0	11.9	44.5		39.8	0.9	0.4		
Oithona plumifera	2.6												
Corycaeus americanus	7.7	6.2	3.9	1.0	2.6		0.8		2.8	0.9	0.9		
Oncaea media	0.4	0.9			10.2		8.6				0.5		
Oncaea venusta	0.2	0.1			2.6		0.2		2.2				
Oithona similis	0.1												
Cyclopoid sp.	0.1												
Sabelliphilidae	1.3										0.9	4.8	
Corycaeus amazonicus		1.8	7.8	0.3	23.0			86.4	2.0				
Oncaea conifera			0.1										
Oithona colcarva							2.3						
Corycaeus giesbrechti							0.1	24.7	0.4				
Oithona sp.							0.8	6.2		1.9			65.4
Oncaea sp.										373.7			
Oncaea mediterranea													
Oithona hebes													
Corycaeus speciosus													

Table H2. (continued)

	1964							1965				
	6/24	7/15	8/28	9/24	10/27	11/18	12/19	1/6	2/25	3/20	4/22	6/2
Harpacticoida						FLOW METER DATA NOT RECORDED						
Copepodites	8.9			2.1	2.1				5.7			
Euterpinna acutifrons	220.4	74.7	6.0	36.3	862.4			0.3		7.1	14.2	3.1
Thomsonula hyaena									5.7			
Clytemnestra scutellata												
Ectinosoma sp.												
Macrosetella gracilis								0.3				
Cyclopoida												
Copepodites	19.6	56.9	10.9	113.1	37.8			3.3	79.6	78.2		12.5
Oithona nana	364.4	131.6	26.6	66.1	524.6		7.5	3.3	39.8	455.1		3.1
Oithona plumifera												
Corycaeus americanus	16.0	39.1			14.7			0.8	11.4	21.3	9.4	6.2
Oncaea media	1.8							1.4				
Oncaea venusta		3.6						1.4				
Oithona similis												
Cyclopoid sp.												
Sabelliphilidae				2.1					159.3			
Corycaeus amazonicus	120.9	14.2		89.6	113.3			1.1				6.2
Oncaea conifera												
Oithona colcava				113.1	8.4		7.5	2.2	39.8	14.2		
Corycaeus giesbrechti			1.2	4.3	2.1							
Oithona sp.				78.9	14.7		11.3	2.2	5.7	35.6		
Oncaea sp.												
Oncaea mediterranea	1.8										4.7	
Oithona hebes				2.1								
Corycaeus speciosus												3.1

Table H2. (continued)

	1963									1964			
	3/11	3/26	5/7	5/13	7/1	8/27	10.1	10/30	11/29	1/25	3/17	4/14	5/21
Amphipoda													
Hyperiidea	0.1		0.1					0.1			0.1	4.8	
Decapod													
Acetes larva			0.7		107.5	0.9	9.4	6.2				0.2	21.8
Lucifer larva			0.3	8.1	51.2	2.7	16.4						87.2
Acetes americanus									P				
Lucifer faxoni		0.1	0.8	8.6	12.8	0.9	4.7	37.0	P			4.8	21.8
Chaetognatha													
Sagitta spp.	5.1	0.2	15.5	3.8	5.1	1.8	245.9	74.0	17.7	0.1	0.9	9.7	43.6
Chordata													
Urochordata													
Oikopleura sp.	1.3	592.9	477.1	3.6	442.9	17.4	265.4	P	1.3				347.8
Doliolum sp.	0.1	2.7	0.3								1.4	4.8	

Table H2. (continued)

	6/24	7/15	8/28	9/24	10/27	11/18	12/19	1/6	2/25	3/20	4/22	6/2
Amphipoda						FLOW METER DATA NOT RECORDED						
Hyperiidea	3.6		0.1	0.1					P	0.1		0.1
Decapod												
Acetes larva	12.4	21.3	2.4	14.9	4.2						4.7	0.1
Lucifer larva	39.1	46.2	43.4	14.9	4.2						0.4	6.2
Acetes americanus	0.1		0.5		0.1				0.1			
Lucifer faxoni	21.3	10.7	9.7	2.1	25.2							3.1
Chaetognatha												
Sagitta spp.	312.9	10.7	18.1	192.0	195.1		8.7	P	39.8	64.0	156.4	6.2
Chordata												
Urochordata												
Oikopleura sp.	17.8	807.1	231.8	492.8	125.9			4.1	170.7	199.1	284.4	6.2
Doliolum sp.											687.4	

Table H3. Meroplankton data from monthly collections in the dredged material disposal site (D) and the entrance channel (C), 24 July through 24 November 1975. Data are the numbers of individuals of each taxon per m^3 of water filtered during each replicate tow.

	24 July				29 August			
	D_1	D_2	C_1	C_2	D_1	D_2	C_1	C_2
CNIDARIA								
Hydromedusa #11	0.7							
Phialidium hemisphaericum	1.9	2.5	0.7	2.4				
Liriope tetraphylla	1.9	3.7	3.5	4.1			593.1	2.3
Hydromedusa #9								
Bougainvillia sp.	0.4			1.8				
Hydromedusa unID		5.5	18.2	12.4				
Ephyra								
Hydromedusa #12							0.4	0.6
Hydromedusa #13	8.9	16.0	1.4	2.9				141.4
Phialidium cf. bicophorum		3.1						
Bougainvillia (or Nmemopsis)		3.7	1.4					
Aglaura cf. hemistoma		1.8						
Anthozoa larva				1.2				
Hybacodon sp.?							0.4	0.6
Hydromedusa #15							4.3	2.3
Hydroid polyp								
Hydromedusa #17								
ANNELIDA								
Polychaeta								
Spionidae larva								
Prionospio pinnata P.L.		18.6		29.4			9.0	4.3
Terebellidae P.L.			0.7				3.0	5.7
Nereis or *Autolytus* P.L.								
Polychaeta #15 P.L.			0.7	0.1			2.6	
Polychaeta #3 P.L.				11.8				
Autolytus prolifer								

Table H3. (continued)

	27 September				27 October			
	D_1	D_2	C_1	C_2	D_1	D_2	C_1	C_2
CNIDARIA								
Hydromedusa #11			0.2					
Phialidium hemisphaericum	4.5	1.8	1.1	2.7	0.3			
Liriope tetraphylla	13.7	18.7	15.0	7.1	0.9		0.3	0.4
Hydromedusa #9								
Bougainvillia sp.	4.0	0.9	9.5	7.2	0.3			
Hydromedusa unID	72.7	186.0	2.6	34.0				1.3
Ephyra								
Hydromedusa #12			0.7					
Hydromedusa #13	7.2	1.8	0.3	7.9	0.3	4.6	0.5	
Phialidium cf. bicophorum			0.7					
Bougainvillia (or Nmemopsis)								
Aglaura cf hemistoma				0.2		0.4	0.3	2.4
Anthozoa larva								
Hybacodon sp.?	1.0	10.1	0.9	1.1	1.2	0.4		2.8
Hydromedusa #15	11.2	15.1	0.4	0.4				
Hydroid polyp				24.7				
Hydromedusa #17				0.8				
ANNELIDA								
Polychaeta								
Spionidae larva		0.4						
Prionospio pinnata P.L.	3.2	2.7		5.1	8.8	4.3	3.1	6.3
Terebellidae P.L.	2.7	3.6	1.6	3.7			2.4	
Nereis or Autolytus P.L.								
Polychaeta #15 P.L.								
Polychaeta #3 P.L.								
Autolytus prolifer								

Table H3. (continued)

	24 November			
	D_1	D_2	C_1	C_2
CNIDARIA				
Hydromedusa #11				
Phialidium hemisphaericum	1.0	2.6		0.4
Liriope tetraphylla				
Hydromedusa #9				
Bougainvillia sp.			3.2	5.3
Hydromedusa unID		0.6	1.4	1.2
Ephyra				
Hydromedusa #12		0.3		0.3
Hydromedusa #13	0.2		0.5	0.2
Phialidium cf. bicophorum				
Bougainvillia (or *Nmemopsis*)				
Aglaura cf. hemistoma				
Anthozoa larva				
Hybacodon sp.?				0.3
Hydromedusa #15				
Hydroid polyp				
Hydromedusa #17				
ANNELIDA				
Polychaeta				
Spionidae larva				
Prionospio pinnata P.L.	1.9	5.9	1.4	0.7
Terebellidae P.L.		0.6		
Nereis or *Autolytus* P.L.				
Polychaeta #15 P.L.	0.5	2.7		
Polychaeta #3 P.L.				
Autolytus prolifer				

Table H3. (continued)

	24 November			
	D_1	D_2	C_1	C_2
ANNELIDA (con'd)				
Polychaeta larva				15.6
Polychaeta L #6				
Magellona P.L.				
Polychaeta #12 P.L.		5.3	0.9	0.2
Nereis sp. larva				
Polychaeta #13 P.L.				
Polychaeta #3 L.				
Owenia larva				
Polychaeta #17 P.L.				
Polychaeta #18 P.L.				
Polydora sp. P.L.			3.8	
Spionidae #15 P.L.				
Polychaeta #5 P.L.		2.7		
Phoronida				
Actinotroch larva				
ECTOPROCT				
Cyhonautes larva				
Cyphonautes L #2				
MOLLUSCA				
Trochophore larva				
Gastropod larva	12.0	2.7	7.6	
Bivalve larva	168.0	293.9	109.8	79.2
Veliger	0.4	13.4	15.2	25.0

Table H3. (continued)

	27 September				27 October			
	D_1	D_2	C_1	C_2	D_1	D_2	C_1	C_2
ANNELIDA (con'd)								
Polychaeta Larva	11.2						1.1	2.3
Polychaeta L #6								
Magellona P.L.								
Polychaete #12 P.L.						0.4		
Nereis sp. larva								
Polychaeta #13 P.L.								
Polychaeta #3 L.								
Owenia larva								
Polychaeta #17 P.L.	0.5	5.0		0.4				
Polychaeta #18 P.L.		0.4						
Polydora sp. P.L.				0.3				
Spionidae #15 P.L.				1.4				
Polvchaeta #5 P.L.								
Phoronida								
Actinotroch larva								
ECTOPROCT								
Cyphonautes larva		5.0						
Cyphonautes L #2								
MOLLUSCA								
Trochophore larva								
Gastropod larva	83.9	90.5	88.6	167.0	46.2	37.7	121.1	163.5
Bivalve larva	2.0	10.1	12.1	24.7	115.4	91.2	31.3	298.1
Veliger				3.1	15.4	1.1	3.9	0.4

Table H3. (continued)

	24 July				29 August			
	D_1	D_2	C_1	C_2	D_1	D_2	C_1	C_2
ANNELIDA (con'd)								
Polychaeta larva	0.4							
Polychaeta L #6	6.7		39.6					
Magellona P.L.	0.7		15.8	0.6				
Polychaete #12 P.L.		0.6		5.8				
Nereis sp. larva		0.6						
Polychaeta #13 P.L.			0.7					
Polychaeta #3 L.			8.0					
Owenia larva			39.6	17.6				
Polychaeta #17 P.L.				4.7			1.7	1.1
Polychaeta #18 P.L.							12.9	14.3
Polydora sp. P.L.								0.6
Spionidae #15 P.L.								
Polychaeta #5 P.L.								
Phoronida								
Actinotroch larva								
ECTOPROCT								
Cyphonautes larva			8.0	29.4				
Cyphonautes L #2			8.0					
MOLLUSCA								
Trochophore larva			23.8	23.6				
Gastropod larva	9.1	37.2	31.8	23.6			5.6	25.7
Bivalve larva		9.3	246.0	88.2			38.7	17.1
Veliger								

Table H3. (continued)

	24 July				29 August			
	D_1	D_2	C_1	C_2	D_1	D_2	C_1	C_2
ARTHROPODA - CRUSTACEA								
Copepoda								
Caligoida								
Caligus (chelifer)								
Caligus sp.								
Cirripedia								
nauplii			8.0	11.8			38.7	17.1
Cypris larva	6.0	27.9	2.1	8.2			0.4	
Stomatopoda								
Pseudozoea larva		0.6						
Mysidacea								
Promysis atlantica							0.4	
Bowmaniella braziliense								
Braziliomysis castroi								
Promysis americana								
Mysidopsis bigelowi								
Cumacea								
Oxyurostylis salinoi							0.4	
unknown								
Amphipoda								
Gammaridea								
Gammarid #1								
Gammarid #2								
Corophium sp.								
Cerapus tubularis								
Gammaridea #3								
Gammaridea #5								
Caprellidea								
Caprellidae unID								

Table H3. (continued)

	27 September				27 October			
	D_1	D_2	C_1	C_2	D_1	D_2	C_1	C_2
ARTHROPODA - CRUSTACEA								
Copepoda								
Caligoida								
Caligus (chelifer)								
Caligus sp.			0.2				0.2	
Cirripedia								
nauplii		5.0	4.0	34.0	3.8		11.7	
Cypris larva	11.2	10.1	44.3	327.8		3.1		
Stomatopoda								
Pseudozoea larva								
Mysidacea								
Promysis atlantica								
Bowmaniella braziliense				0.2				
Braziliomysis castroi				0.4				
Promysis americana				0.3				
Mysidopsis bigelowi				1.2		0.4		
Cumacea								
Oxyurostylis salinoi			0.4	0.8		0.8	0.2	
unknown								0.4
Amphipoda								
Gammaridea								
Gammarid #1								
Gammarid #2			0.2	0.1				
Corophium sp.				0.4				
Cerapus tubularis				0.2				
Gammaridea #3						0.2		
Gammaridea #5				0.2				
Caprellidea								
Caprellidae unID				0.2				

Table H3. (continued)

	24 November D_1	D_2	C_1	C_2
ARTHROPODA - CRUSTACEA				
Copepoda				
Caligoida				
Caligus (chelifer)				
Caligus sp.				
Cirripedia				
nauplii	264.0	82.7	568.2	608.3
Cypris larva				4.2
Stomatopoda				
Pseudozoea larva				
Mysidacea				
Promysis atlantica				
Bowmaniella braziliense				
Braziliomysis castroi				
Promysis americana				
Mysidopsis bigelowi		0.3		
Cumacea				
Oxyurostylis salinoi				
unknown				
Amphipoda				
Gammaridea				
Gammarid #1				
Gammarid #2				
Corophium sp.				
Cerapus tubularis				
Gammaridea #3				
Gammaridea #5				
Caprellidea				
Caprellidae unID				

Table H3. (continued)

	24 July				29 August			
	D_1	D_2	C_1	C_2	D_1	D_2	C_1	C_2
ARTHROPODA - CRUSTACEA (con'd)								
Isopoda								
Isopoda #A=2-DS							0.4	
Isopoda #A-1-DA								0.6
Isopoda (*Munna* sp.)								
Isopod								
Decapoda								
Pinnixa sp. zoea	7.4	27.1	6.3	11.2			16.8	18.3
Pinnixa chaetoperana zoea	1.5	1.8	0.7	0.6			0.4	0.6
Upogebia affinis zoea			3.5	1.2			5.2	6.9
Callianassa sp. 2 zoea							0.4	1.7
Clibanarius vittatus zoea			3.5	0.6			3.9	3.4
Paguridae zoea		0.6	2.8	1.8			3.4	2.9
Porcellanidae zoea							0.4	0.6
Paguridae glaucothoe		0.6						
Hexapanopeus sp. megalops			0.7					
Ovalipes ocellata zoea #5				7.1			1.7	
Ogyrides limicola zoea							0.4	1.2
Anomurai #2 zoea								
Pinnotheres zoea	0.4	0.6		6.5				0.6
Callianassa sp. 1 zoea								
Alpheidae zoea			0.7				0.4	0.6
Portunidae zoea	2.2	2.5	5.6	4.7			0.9	1.1
Xanthidae zoea	2.2		5.6	8.8				
Sesarma sp. megalops	0.4							0.6
Anomura #12 zoea	0.4		2.1	1.8				
Palaemonetes sp. zoea								
Hippolyte sp. zoea	0.7		0.7				0.9	0.6
Penaeidae protozoea							1.7	5.7
Uca zoea	1.1	3.7					0.4	0.6

Table H3. (continued)

	27 September				27 October			
	D_1	D_2	C_1	C_2	D_1	D_2	C_1	C_2
ARTHROPODA - CRUSTACEA (con'd)								
Isopoda								
Isopoda #A=2-DS								
Isopoda #A-1-DA								
Isopoda (*Munna* sp.)	0.7	15.1			0.3	1.3		
Isopod								0.2
Decapoda								
Pinnixa sp. zoea			116.8		23.1	34.6	289.1	211.5
Pinnixa chaetoperana zoea	4.0	2.7	1.1	0.2	11.5	3.1	15.6	28.8
Upogebia affinis zoea			3.2	0.6			0.9	2.7
Callianassa sp. 2 zoea				0.3				
Clibanarius vittatus zoea			2.8	1.7				
Paguridae zoea			4.1					
Porcellanidae zoea		0.4						
Paguridae glaucothoe				0.2	1.5			0.8
Hexapanopeus sp. megalops		0.4		1.9		0.4		0.4
Ovalipes ocellata zoea #5				0.4				
Ogyrides limicola zoea		0.4		0.8	0.9	0.2	1.1	0.8
Anomurai #2 zoea								
Pinnotheres zoea								
Callianassa sp. 1 zoea			0.7					
Alpheidae zoea			1.1					
Portunidae zoea								
Xanthidae zoea								
Sesarma sp. megalops	3.7	2.7	1.6	7.4				
Anomura #12 zoea								
Palaemonetes sp. zoea		0.4		0.2				
Hippolyte sp. zoea	0.7	1.3	2.0	0.4	0.6		0.5	2.3
Penaeidae protozoea					0.3			
Uca zoea			0.2					

Table H3. (continued)

	24 November			
	D_1	D_2	C_1	C_2
ARTHROPODA - CRUSTACEA (con'd)				
Isopoda				
Isopoda #A=2-DS				
Isopoda #A-1-DA				
Isopoda (*Munna* sp.)		2.7		
Isopod				
Decapoda				
Pinnixa sp. zoea	0.3	1.3	12.4	20.4
Pinnixa chaetoperana zoea				
Upogebia affinis zoea				
Callianassa sp. 2 zoea				
Clibanarius vittatus zoea				
Paguridae zoea				
Porcellanidae zoea			0.5	
Paguridae glaucothoe				
Hexapanopeus sp. megalops				
Ovalipes ocellata zoea #5				
Ogyrides limicola zoea				
Anomurai #2 zoea				
Pinnotheres zoea				
Callianassa sp. 1 zoea				
Alpheidae zoea				
Portunidae zoea				
Xanthidae zoea				
Sesarma sp. megalops				
Anomura #12 zoea				
Palaemonetes sp. zoea				
Hippolyte sp. zoea				1.3
Penaeidae protozoea				
Uca zoea				

Table H3. (continued)

	24 July				29 August			
	D_1	D_2	C_1	C_2	D_1	D_2	C_1	C_2
ARTHROPODA - CRUSTACEA (con'd)								
Trachypeneus sp. protozoea			2.1					
Callinectes sp. zoea							0.4	
Upogebia sp. 2 zoea		1.2	2.1	3.5			2.2	2.3
Penaeus sp. mysis	4.8	10.5	1.4	8.2			9.9	6.3
Callinectes sp. megalops			0.7					
Pinnotheres sp. megalops			0.7				0.4	0.6
Lepidopa cf. *benedicti* zoea		0.6					0.4	
Sesarma sp. zoea			1.4					
Decapoda metanauplius				0.6				
Callianassa sp. 3 zoea							1.7	0.6
Neopanope sp. zoea							0.9	3.4
Decapoda megalops							3.0	
Brachyura #7 zoea							0.4	
Hippolysmata wurdemanni zoea								1.2
Euceramus praelongus zoea								
Decapoda sp. protozoea								
Caridea #3 zoea								
Panopeus herbstii zoea								
Pinnixa sayana zoea								
Pagurus pollicaris zoea								
Xiphopeneus mysis								
Trachypeneus mysis								
Menippe mercenaria megalops								
Pinnixa sp. megalops								
Hexapanopeus anugustifrons zoea		0.6	1.4	2.9				
Alpheis heterochaelis zoea								
Alpheis normani zoea								
Pagurus longicarpus zoea								

Table H3. (continued)

	27 September				27 October			
	D_1	D_2	C_1	C_2	D_1	D_2	C_1	C_2
ARTHROPODA - CRUSTACEA (con'd)								
Trachypeneus sp. protozoea								
Callinectes sp. zoea								
Upogebia sp. 2 zoea		1.3	3.3	0.1				0.4
Penaeus sp. mysis			1.4			0.8	0.2	
Callinectes sp. megalops				1.5		0.4	0.2	
Pinnotheres sp. megalops				0.6	0.3		0.2	0.4
Lepidopa cf. benedicti zoea								
Sesarma sp. zoea	1.7	0.4	0.5					
Decapoda metanauplius								
Callianassa sp. 3 zoea				0.2				
Neopanope sp. zoea								
Decapoda megalops					0.3			
Brachyura #7 zoea								
Hippolysmata wurdemanni zoea			0.2			0.4	0.2	
Euceramus praelongus zoea			2.0	1.2	1.0		0.5	
Decapoda sp. protozoea			4.0					
Caridea #3 zoea			0.9					
Panopeus herbstii zoea	0.2			0.2				
Pinnixa sayana zoea	67.1	70.4		47.3				
Pagurus pollicaris zoea	0.5	1.3		0.6	3.2	1.2	3.4	2.4
Xiphopeneus mysis	0.5	0.9		0.2			0.2	
Trachypeneus mysis				3.9				
Menippe mercenaria megalops				0.2				
Pinnixa sp. megalops				0.4	0.6	0.8	0.3	0.8
Hexapanopeus anugustifrons zoea	2.5	0.9	40.3	7.7		0.4	0.5	0.4
Alpheis heterochaelis zoea		0.4						
Alpheis normani zoea							0.2	
Pagurus longicarpus zoea							0.5	0.9

Table H3. (continued)

	24 November			
	D_1	D_2	C_1	C_2
ARTHROPODA - CRUSTACEA (con'd)				
Trachypeneus sp. protozoea				
Callinectes sp. zoea				
Upogebia sp. 2 zoea				
Penaeus sp. mysis				
Callinectes sp. megalops				
Pinnotheres sp. megalops				
Lepidopa cf. benedicti zoea				
Sesarma sp. zoea				
Decapoda metanauplius				
Callianassa sp. 3 zoea				
Neopanope sp. zoea				
Decapoda megalops				
Brachyura #7 zoea				
Hippolysmata wurdemanni zoea			0.5	1.0
Euceramus praelongus zoea				0.7
Decapoda sp. protozoea				
Caridea #3 zoea				
Panopeus herbstii zoea				
Pinnixa sayana zoea				
Pagurus pollicaris zoea		0.6	2.3	2.7
Xiphopeneus mysis				
Trachypeneus mysis				
Menippe mercenaria megalops				
Pinnixa sp. megalops				
Hexapanopeus anugustifrons zoea				
Alpheis heterochaelis zoea				
Alpheis normani zoea				
Pagurus longicarpus zoea				1.0

Table H3. (continued)

	24 July				29 August			
	D_1	D_2	C_1	C_2	D_1	D_2	C_1	C_2
ARTHROPODA - CRUSTACEA (con'd)								
Porcellana sp. zoea								
Paguridae #7 zoea								
Euceramus praelongus megalops								
Penaeus setiferus P.L.	0.7		0.7	2.4			1.3	
Penaeus aztecus P.L.								
Trachypeneus P.L.								
ECHINODERMATA								
Bipinnaria larva								
Auricularia larva								
Ophiopluteus larva								

Table H3. (continued)

	27 September				27 October			
	D_1	D_2	C_1	C_2	D_1	D_2	C_1	C_2
ARTHROPODA - CRUSTACEA (con'd)								
Porcellana sp. zoea					1.2		0.8	
Paguridae #7 zoea						0.4		0.4
Euceramus praelongus megalops					0.3	0.8		
Penaeus setiferus P.L.								
Penaeus aztecus P.L.				0.2				
Trachypeneus P.L.				0.2				
ECHINODERMATA								
Bipinnaria larva								
Auricularia larva								
Ophiopluteus larva								

Table H3. (continued)

	24 November			
	D_1	D_2	C_1	C_2
ARTHROPODA - CRUSTACEA (con'd)				
Porcellana sp. zoea				
Paguridae #7 zoea				
Euceramus praelongus megalops				
Penaeus setiferus P.L.				
Penaeus aztecus P.L.				
Trachypeneus P.L.				
ECHINODERMATA				
Bipinnaria larva				
Auricularia larva				
Ophiopluteus larva				

Table H4. Holoplankton data from monthly collections in the dredged disposal site (D) and the entrance channel (C), 24 July through 24 November 1975. Data are numbers of individuals of each taxon per m^3 of water filtered during each replicate tow.

	24 July				29 August			
	D_1	D_2	C_1	C_2	D_1	D_2	C_1	C_2
PROTOZOA					SAMPLE LOST	SAMPLE LOST		
Tintinnid #2			8.0					
Tintinnid #4				17.6				
Elphidium sp.								
Miliammina sp.								
Trachammina sp.								
Foraminifera unID								
CNIDARIA								
Nectophore		1.2					0.9	
Siphonophora		6.2	4.2	3.5				
Muggiaea kochi	0.4							
Eudoxides spiralis	6.0							
Siphonophore fragment			1.4					
CTENOPHORA								
Beroe ovata								
Mnemiopsis mcCradyi								
Larva								
ANNELIDA								
Polychaeta								
Sagitella kowalevskii		2.5	0.7					
Tomopterus P.L.								
MOLLUSCA								
Creseis acicula		1.8	1.4	4.7			0.4	0.6

Table H4 (continued)

	27 September				27 October			
	D_1	D_2	C_1	C_2	D_1	D_2	C_1	C_2
PROTOZOA								
Tintinnid #2								
Tintinnid #4								
Elphidium sp.				68.0				
Miliammina sp.				6.2				
Trachammina sp.				12.4				
Foraminifera unID						18.9		
CNIDARIA								
Nectophore	139.8	125.7	6.2	10.1	10.3	6.6	0.3	2.8
Siphonophora								
Muggiaea								
Eudoxides spirales								
Siphonophore fragment								
CTENOPHORA								
Beroe ovata	0.5		0.4	2.3	0.9	2.7	0.5	1.2
Mnemiopsis mcCradyi	11.4	4.4	0.2		0.2			
Larva					3.8			
ANNELIDA								
Polychaeta								
Sagitella kowalevskii	0.2	0.9		0.2	18.7	18.2	2.2	5.5
Tomopterus P.L.							0.2	
MOLLUSCA								
Creseis acicula					0.6	1.1		0.8

Table H4 (continued)

	24 November			
	D_1	D_2	C_1	C_2
PROTOZOA				
Tintinnid #2				
Tinntinnid #4				
Elphidium sp.				
Miliammina sp.				
Trachammina sp.				
Foraminifera unID				
CNIDARIA				
Nectophore	236.0	513.0	250.0	162.5
Siphonophora				0.3
Muggiaea kochi				
Eudoxides spiralis				
Siphonophore fragment				
CTENOPHORA				
Beroe ovata	4.6	6.3	2.0	2.9
Mnemiopsis mcCradyi				
Larva				
ANNELIDA				
Polychaeta				
Sagitella kowalevskii		1.2		0.6
Tomopterus P.L.				
MOLLUSCA				
Creseis acicula				

Table H4 (continued)

	24 July				29 August			
	D_1	D_2	C_1	C_2	D_1	D_2	C_1	C_2
ARTHROPODA - CRUSTACEA								
Cladocera								
Penilia avirostris	3869.8	3993.0	4858.4	5200.0			2258.1	642.9
Evadne sp.	36.3	55.8	7.7	11.8			25.8	8.6
Ostracoda								
Euconchoecia sp.	3.0	4.3	21.0	5.3			0.4	
Copepoda								
Copepod nauplii	57.4	83.8	857.4	494.2			64.5	30.0
Argulus sp.								
Calanoids								
Acartia tonsa	217.7	37.2	428.6	553.0	SAMPLE LOST	SAMPLE LOST	8167.7	3445.7
Acartia copepodids		18.6					2051.6	1362.9
A. lilljeborgii							68.0	47.1
Paracalanus crassirotris	84.7	18.6	1492.4	529.4			64.5	12.9
P. (parvus grp) adults	1185.1	1312.4	714.4	882.4			129.0	21.4
P. (parvus grp) copepodids								
P. copepodids								
Nannocatanus minor	15.1							2.3
Labidocera aestiva	12.1	9.3	79.4	47.0			154.8	30.0
Labidocera copepodids								
Centropages velificatus	241.9	148.9	254.0	247.0			77.4	30.0
Temora turbinata	302.3	363.0	71.4	123.6			1329.0	342.9
T. stylifera	57.4	6.8	1.4	0.6				
Eucalanus pileatus		418.8	238.2					
Euchaeta paraconcinna								
Undinula vulgaris								
Rhincalanus sp.								
Temora sp. copepodids								
Undinula vulgaris								
Centropages velificatus copepodids								

Table H 4 (continued)

	27 September				27 October			
	D_1	D_2	C_1	C_2	D_1	D_2	C_1	C_2
ARTHROPODA - CRUSTACEA								
Cladocera								
Penilia avirostris	0.2					6.3		
Evadne sp.								
Ostracoda								
Euconchoecia sp.					0.6			
Copepoda								
Copepod nauplii	145.3	130.7	40.3	40.2	176.9	289.3	429.7	346.2
Argulus sp.								
Calanoids								
Acartia tonsa	111.8	246.4	547.6	1076.3	26.9	56.6	164.1	163.5
Acartia copepodids	55.9	50.3	193.3	403.6	176.9	81.8	226.6	259.6
A. lilljeborgii	0.2		20.1	43.3			3.9	
Paracalanus crassirotris	16.8	5.0	4.0	15.5	7.7		7.8	
P. (parvus grp) adults	28.0	40.2	32.2	30.9	492.3	301.9	78.1	288.5
P. (parvus grp) copepodids								
P. copepodids								
Nannocatanus minor								
Labidocera aestiva	39.1	75.4	36.2	99.0	3.8	1.5	58.6	9.6
Labidocera copepodids								
Centropages velificatus	106.2	150.8	100.7	64.9	246.2	283.0	609.3	538.5
Temora turbinata	33.5	140.8	36.2	52.6	238.5	314.5	1367.2	980.8
T. stylifera		0.4			7.7	0.8		2.8
Eucalanus pileatus	218.0	543.0		133.0	1300.0	1163.5	406.3	846.2
Euchaeta paraconcinna								
Undinula vulgaris		5.0			1.2	1.5	2.5	0.4
Rhincalanus sp.								
Temora sp. copepodids								
Undinula vulgaris								
Centropages velificatus copepodids								

Table H4 (continued)

	24 November			
	D_1	D_2	C_1	C_2
ARTHROPODA - CRUSTACEA				
Cladocera				
Penilia avirostris				
Evadne sp.				
Ostracoda				
Euconchoecia sp.				
Copepoda				
Copepod nauplii	224.0	130.9	189.4	245.8
Argulus sp.				
Calanoids				
Acartia tonsa	688.0	427.5	628.8	341.7
Acartia copepodids	488.0	325.0	689.4	800.0
A. lilljeborgii				
Paracalanus crassirotris	36.0	18.7	136.4	112.5
P. (parvus grp) adults	148.0	235.1	117.4	66.7
P. (parvus grp) copepodids				
P. copepodids				
Nannocatanus minor				
Labidocera aestiva	60.0	24.0	64.4	79.2
Labidocera copepodids				
Centropages velificatus	320.0	26.7	26.5	62.5
Temora turbinata	8.0	5.3	7.6	12.5
T. stylifera				
Eucalanus pileatus	176.0	315.3	98.5	70.8
Euchaeta paraconcinna				
Undinula vulgaris	0.3	0.3	0.2	
Rhincalanus sp.				
Temora sp. copepodids				
Undinula vulgaris				
Centropages velificatus copepodids				

Table H4 (continued)

	24 July				29 August			
	D_1	D_2	C_1	C_2	D_1	D_2	C_1	C_2
ARTHROPODA - CRUSTACEA (con'd)								
Eurytemora hirundoides								
Paracalanus aculeatus								
Euchata copepodids								
Eucalanus (pileatus)	374.9			247.0			9.0	13.7
Calanopia americana	3.0	2.5	4.9	1.8			6.9	2.3
Pontellopsis villosa		0.6						
Pontella cf meadii							0.9	
Pseudodiaptomus coronatus							0.4	
Calanoid unID								
Harpacticoida								
Euterpina acutifrons			55.6	23.6	SAMPLE LOST	SAMPLE LOST	25.8	17.1
Macrosetella gracilis								
Microsetella narvegica				8.0				
Longipedia coronata		0.6						
Cytemnestra rostrata								
Ectinosomidae sp.								
Cyclopoids								
copepodites								
Oithona nana			71.4	17.6				
Oithona colcarva			341.4	141.2			25.8	4.3
Oithona Plumifera	54.4	27.9	23.8	11.8				
Oithona sp.	0.7							
Corycaeus giesbrechti			8.0	23.6			12.9	8.6
Corycaeus copepodites								
Corycaeus americanus	12.1	9.3	15.8	11.8				
Corycaeus amazonicus	36.3	46.5	23.8	8.2			51.6	5.7
Oncaea venusta								
Ergasilus sp.								
Oncaea sp.	0.7	0.6						

Table H4 (continued)

	27 September				27 October			
	D_1	D_2	C_1	C_2	D_1	D_2	C_1	C_2
ARTHROPODA - CRUSTACEA (con'd)								
Eurytemora hirundoides								
Paracalanus aculeatus								
Euchata copepodids								
Eucalanus (pileatus)			124.8					
Calanopia americana					2.5	6.6	0.5	3.1
Pontellopsis villosa								
Pontella cf meadii								
Pseudodiaptomus coronatus				3.1				
Calanoid unID				3.1				
Harpacticoida								
Euterpina acutifrons	5.6	15.1	12.1	9.3		3.1	7.8	4.8
Macrosetella gracilis					1.2	6.3	0.5	0.4
Microsetella narvegica								
Longipedia coronata								
Cytemnestra rostrata								0.4
Ectinosomidae sp.				3.1				
Cyclopids								
copepodites								
Oithona nana	5.6		4.0					
Oithona colcarva	11.2			12.4				
Oithona plumifera								
Oithona sp.			4.0		11.5			
Corycaeus giesbrechti	7.5	10.1	4.0	3.1	19.2	25.2	195.3	259.6
Corycaeus copepodites							390.6	
Corycaeus americanus			8.1		3.8			
Corycaeus amazonicus	22.4	60.3	4.0	15.5	561.5	245.3	343.8	740.4
Oncaea venusta					7.7	12.6	0.2	2.8
Ergasilus sp.								
Oncaea sp,								

Table H4 (continued)

	24 November			
	D_1	D_2	C_1	C_2
ARTHROPODA - CRUSTACEA (con'd)				
Eurytomora hirundoides				
Paracalanus aculeatus				
Euchata copepodids				
Eucalanus (pileatus)				
Calanopia americana				
Pontellopsis villosa				
Pontella cf meadii				
Pseudodiaptomus coronatus				0.3
Calanoid unID				
Harpacticoida				
Euterpina acutifrons	12.0	5.3		
Macrosetella gracilis				
Microsetella narvegica				
Longipedia coronata				
Cytemnestra rostrata				
Ectinosomidae sp.				
Cyclopids				
copepodites				
Oithona nana	32.0	10.7	53.0	66.7
Oithona colcarva	40.0	42.8	15.2	20.8
Oithona plumifera				
Oithona sp.				
Corycaeus giesbrechti				
Corycaeus copepodids	0.3	0.6		0.7
Corycaeus americanus				
Corycaeus amazonicus	16.0	21.4	11.4	12.5
Oncaea venusta	1.6	5.3	3.8	
Ergasilus sp.				
Oncaea sp.				

Table H4 (continued)

	24 July				29 August			
	D_1	D_2	C_1	C_2	D_1	D_2	C_1	C_2
ARTHROPODA - CRUSTACEA (con'd)								
Sapphirina nigromaculata		0.6						
Sabelliphilidae sp.								
Amphipoda								
Hyperiidea								
Hyperiid sp. 1								
Parathemisto sp.	4.8	10.5	2.1	0.6				
Hyperidea sp. #2								
Hyperiella sp.								
Decapoda								
Acetes larva	12.1	27.9	1.4	5.8	SAMPLE LOST	SAMPLE LOST	3.9	2.3
Lucifer larva	9.1	18.6	8.0	17.6			167.7	34.3
Lucifer faxoni	13.4	4.9	17.5	28.8			141.9	197.1
Acetes americanus	12.3	16.0	3.5	1.2			11.2	17.1
CHAETOGNATHA								
Sagitta sp.	87.8	111.7	174.6	329.4				108.0
Sagitta enflata	35.7	45.5	20.4	30.6				
Sagitta tenuis							77.4	
Sagitta hispida								
CHORDATA								
Urochordata								
Oikopleura spp.	217.7	344.4	373.1	411.8			1896.8	694.3
Doliolum sp.	81.6	27.9	71.4	64.8				
Salpa sp.								

Table H4 (Continued)

	27 September				27 October			
	D_1	D_2	C_1	C_2	D_1	D_2	C_1	C_2
ARTHROPODA - CRUSTACEA (con'd)								
Sapphirina nigromaculata	0.2				3.1	1.5	0.6	1.2
Sabelliphilidae sp.				0.2				
Amphipoda								
Hyperiidae								
Hyperiid sp. 1	4.2	3.6			21.5	37.7	1.0	4.4
Parathemisto sp.								
Hyperidea sp. #2							0.2	0.8
Hyperiella sp.								
Decapoda								
Acetes larva	5.6		2.3	12.4	1.3	1.5	15.6	3.8
Lucifer larva	5.6	25.1		0.4	7.7	6.3	3.9	0.5
Lucifer faxoni	0.7	3.1	3.5	1.2	1.0	2.4	7.7	1.9
Acetes americanus	3.0	7.6		185.6	11.2	5.5	9.3	11.3
CHATEOGNATHA								
Sagitta sp.							546.9	
Sagitta enflata	3.2	2.2	0.5	0.8	18.4	17.4	9.1	13.9
Sagitta tenuis	1095.7	1005.6	531.5	525.8	500.0	452.8		653.8
Sagitta hispida	3.0	4.0	0.2		1.7	8.2	0.7	2.1
CHORDATA								
Urochordata								
Oikopleura spp.	44.7	55.3	12.1	6.2			3.9	9.6
Doliolum sp.	1.5	1.8	1.6				2.0	4.6
Salpa sp.								

Table H4 (continued)

	24 November			
	D_1	D_2	C_1	C_2
ARTHROPODA - CRUSTACEA (con'd)				
Sapphirina nigromaculata				
Sabelliphilidae sp.				
Amphipoda				
Hyperiidea				
Hyperiid sp. 1	2.9	1.5		3.3
Parathemisto sp.				
Hyperidea sp. #2				
Hyperilla sp.	0.3	1.7		
Decapoda				
Acetes larva	0.3	2.7	0.5	
Lucifer larva				
Lucifer faxoni				0.3
Acetes americanus	2.6	4.6	4.5	2.0
CHAETOGNATHA				
Sagitta sp.				
Sagitta enflata	1.6	0.6	0.2	0.3
Sagitta tenuis	208.0	491.6	208.3	229.2
Sagitta hispida				
CHORDATA				
Urochordata				
Oikopleura spp.				
Doliolum sp.				
Salpa sp.				

Table H5. Meroplankton data from the Texas City dredged material experimental disposal on 9 October 1975. Data are the numbers of individuals of each taxon per m^3 of water filtered.

	T1	T2	T3
CNIDARIA			
Medusa #15	1.2		0.7
Medusa #13	26.2	26.0	42.4
Phialidium hemisphericum	3.1	1.6	8.0
Liriope tetraphylla	1.2		
Medusa #12	2.5	1.6	0.7
Medusa #10	0.6	19.0	
Bougainvillia sp.	44.0	24.4	31.6
Medusa unknown		38.0	
Phialidium bicorphorum			2.1
Blackfordia virginica			0.7
NEMERTINA			
Pilidium Larvae	59.0		
NEMATODA		19.0	
ANNELIDA			
Polychaeta			
Magelona rosea P.L.	2.5	0.8	63.2
Polychaeta #7 P.L.	29.4		
Polychaeta unknown P.L.	147.2		221.1
Terebellidae P.L.	13.0	7.2	7.0
Prionospio pinnata P.L.	19.4	19.8	3.5
Polychaeta #3 P.L.		57.0	31.6
Polychaeta Larva #8		38.0	
Polychaeta Larva #17	0.6	1.6	31.6
Polychaeta Larva #18	0.6	0.8	
Polychaeta Larva #15	0.6	0.8	1.4
Owenia fusiformis Larva		57.0	31.6
MOLLUSCA			
Trochophore Larva	235.6	19.0	
Gastropoda Larva	147.2	38.0	63.2
Bivalvia Larva	294.6	190.0	63.2
Veligers		0.8	
Lolliguncula brevis		1.6	
ARTHROPODA - CRUSTACEA			
Copepoda			
Caligoida			
Caligus metanauplis		19.0	
Cirripedia			
nauplii	176.8	19.0	94.7
cypris larva		0.8	31.6

Table H5. (continued)

	T1	T2	T3
Isopoda	1.9	0.8	
Munna sp.			2.8
Bopyridae			0.7
Decapoda			
Penaeidea mysis	0.6		0.7
Pinnixa zoea	54.0	48.5	13.4
Pinnotheres zoea		19.0	
Hippolyte zoea	1.9	0.8	
Upogebia zoea	1.2		
Callianassa zoea	1.2		
Alpheidae zoea	0.6		
Clibanarius vittatus zoea	0.6		
Pagurus pollicaris zoea	3.7	4.1	
Porcellana sp. zoea	1.2	4.0	
Paguridae glaucothoe	1.2		2.1
Portunidae zoea	0.1		0.7
Hexpanopeus zoea	8.1	8.2	6.4
Euceramus praelongus zoea	0.1	0.8	0.7
Hexapanopeus megalops	4.3	7.2	
Pinnotheres megalops	1.2	4.0	
Emerita sp. zoea	0.6		
Pinnixa chaetopterana zoea		3.2	
Hippolyzmata wurdemannii zoea	1.2	0.8	0.7
Ogyrides zoea		2.4	
Upogebia zoea #2			0.7
Paguridae zoea			2.8
Decapoda megalops			0.7
Callinectes megalops			0.7
Sesarma megalops			0.7
BRYOZOA			
Cyphonautes Larva			31.6
ECHINODERMATA			
Auricularia Larva	294.6	38.0	63.2
Echinopluteus Larva			63.2
CHORDATA			
Vertebrata - Pisces			
Larva (unknown)	3.7	4.9	
Anchoa mitchilli		0.8	
Anchoa Larva		0.8	
OTHER			
Egg		19.0	189.5

Table H6. Holoplankton data from the Texas City dredged material experimental disposal on 9 October 1975. Data are the numbers of individuals of each taxon per m^3 of water filtered.

	T1	T2	T3
PROTOZOA			
Noctiluca scintillans	6127.2	4560.0	11210.5
Foraminifera #2		38.0	
Tintinnida	677.6	57.0	189.5
Foraminifera #1		38.0	
CNIDARIA			
Nectophore	14.4	4.2	92.6
CTENOPHORA			
Beroe ovata	5.0	2.4	19.7
Rotifera	59.0		
ANNELIDA			
Polychaeta			
Sagitella kowalevskii P.L.	0.6		
Tomopteris sp.	0.6		
Autolylis prolifer			1.4
MOLLUSCA			
Pteropoda	0.6		0.7
ARTHROPODA - CRUSTACEA			
Cladocera			
Penilia avirostris	59.0	57.0	126.3
Copepoda			
Copepod nauplii	2769.0	627.0	1010.5
Calanoida			
Copepodites	972.0	1197.0	1926.3
Acartia tonsa	942.6	1311.0	1831.6
Acartia lilljeborgii		0.8	
Paracalanus crassirostris	2739.6	627.0	1010.5
Paracalanus (parvus group)	59.0	266.0	378.9
Labidocera aestiva	147.6	95.0	221.1
Centropages velificatus	412.4	399.0	410.5
Temora turbinata	117.8	171.0	157.9
Eucalanus pileatus	383.0	532.0	252.6
Calanopia americana		19.0	
Harpacticoida			
Copepodites			31.6
Euterpina acutifrons	206.2	247.0	221.1
Ectinosoma sp.		1.6	
Cyclopoids			
Oithona nana	1738.0	190.0	189.5
Oithona calcarva	3093.0	912.0	2336.8

Table H6. (continued)

	T1	T2	T3
Corycaeus amaeonicus	59.0	57.0	
Saphirella sp.	117.8		31.6
Corycaeus geisbrechti	147.2	114.0	
Sapphirina sp.	0.6	0.8	0.7
Sabelliphilidae		19.0	
Oncaea sp.			63.2
Corycaeus sp. Copepodites			94.7
Amphipoda			
Hyperiidea	8.1	7.2	17.6
Decapoda			
Lucifer larva	3.7		2.1
Acetes larva		19.0	0.7
Postlarvae and Adults			
Lucifer faxoni	1.2	3.2	2.1
Acetes americanus	3.1	6.6	0.7
CHAETGNATHA			
Sagitta tenuis	2032.6	988.0	1863.2
Sagitta enflata	3.1	2.5	7.1
Sagitta hispida	0.6		
CHORDATA			
Urochordata			
Oikopleura sp.	4772.0		3315.8
Doliolum sp.	176.8	190.0	221.1

APPENDIX I

RAW PHYTOPLANKTON DATA FROM THE EXPERIMENTAL STUDY

Table II. Phytoplankton pigments in mg/m^3 collected monthly at the entrance to the Galveston Ship Channel and in the offshore disposal area, Galveston, Texas.

	SHIP CHANNEL				DISPOSAL AREA			
	Surface		Bottom		Surface		Bottom	
Date and Replicate	Chpl.	Phaeo.	Chpl.	Phaeo.	Chpl.	Phaeo.	Chpl.	Phaeo.
29 August 1975								
Replicate 1	1.6960	-0.1600	0.4480	0.2080	0.0160	0.2080	0.0160	0.3520
	1.6960	-0.1600	0.4480	0.2080	0.0160	0.2080	0.0160	0.3520
Total Average Pigments	1.6960		0.6560		0.2240		0.3680	
19 September 1975								
Replicate 1	0.1440	0.0000	0.2000	0.0400	0.0460	0.0080	0.2080	0.5760
Replicate 2	0.1440	0.0320	0.1760	0.0480	0.0880	0.0080	0.3440	0.1040
$\bar{X}$	0.1440	0.0160	0.1880	0.0440	0.0760	0.0080	0.2760	0.3400
Total Average Pigments	0.1600		0.2320		0.0840		0.6160	
30 October 1975								
Replicate 1	0.0160	0.0096	0.0021	0.0023	0.0002	0.0055	0.0004	0.0055
Replicate 2	0.0112	0.0032	0.0027	0.0013	0.0006	0.0047	0.0049	0.0038
$\bar{X}$	0.0136	0.0064	0.0024	0.0018	0.0004	010051	0.0027	0.0044
Total Average Pigments	0.0200		0.0042		0.0055		0.0071	
24 November 1975								
Replicate 1	0.0039	0.0131	0.0012	0.0031	0.0013	0.0134	0.0002	0.0040
Replicate 2	0.0009	0.0087	0.0083	0.0000	0.0021	0.0108	0.0004	0.0064
$\bar{X}$	0.0024	0.0108	0.0048	0.0016	0.0017	0.0121	0.0074	0.0052
Total Average Pigments	0.0132		0.0032		0.0229		0.0126	
17 December 1975								
Replicate 1	0.1296	0.0416	0.2080	0.1120	0.0736	0.0576	0.1184	0.0368
Replicate 2	0.1600	0.0960	0.1312	0.0304	0.1024	0.0224	0.0992	0.0512
$\bar{X}$	0.1448	0.0688	0.1696	0.0712	0.0880	0.0400	0.1088	0.0440
Total Average Pigments	0.2136		0.2408		0.1280		0.1528	

Table I2. Phtyoplankton pigments in mg/m^3 collected during disposal operations on 9 September and 9 October 1975.

	PRE-DISPOSAL				DISPOSAL			
	Surface		Bottom		Surface		Bottom	
Date and Replicate	Chpl.	Phaeo.	Chpl.	Phaeo.	Chpl.	Phaeo.	Chpl.	Phaeo.
9 September 1975								
Replicate 1	0.3200	0.0080	0.3440	0.1200	0.2080	0.1200	0.3040	0.0080
Replicate 2	0.2960	0.2560	0.2640	0.0560	0.2000	0.0000	0.1520	0.0240
$\bar{X}$	0.3080	0.1320	0.3040	0.0880	0.2040	0.0600	0.2280	0.0160
Total Average Pigments	0.4400		0.3600		0.2640		0.2440	
9 October 1975 (First Disposal)								
Replicate 1	0.2240	0.1120	0.5120	-0.1600	0.0800	0.1520	0.1920	0.0320
Replicate 2					0.1120	0.0080	0.2720	0.1600
$\bar{X}$					0.0960	0.080	0.2320	0.0960
Total Average Pigments	0.3360		0.5120		0.1760		0.3280	

Table I3. Phytoplankton pigments in mg/m^3 collected during the second disposal operation on 9 October 1975.

PRE-DISPOSAL

	Surface		Bottom	
	Chpl.	Phaeo.	Chpl.	Phaeo.
Subsample 1	0.1920	0.2080	0.2560	0.0800
Subsample 2	0.2240	0.1120	0.3200	0.8640
$\bar{X}$	0.2080	0.1600	0.2880	0.4720
Total Pigments	0.3680		0.7600	

POST-DISPOSAL

	Surface		Bottom	
Sample	Chpl.	Phaeo.	Chpl.	Phaeo.
A - 10 minutes	0.2560	0.1600	0.1920	-0.0224
Total Pigments	0.2080		0.190	
B - 16 minutes	0.1760	0.0800	0.2080	0.0480
Total Pigments	0.2560		0.2560	
C - 30 minutes	0.1280	0.0320	0.2080	0.0640
Total Pigments	0.1600		0.2720	
D - 50 minutes	0.2080	0.3520	0.2090	0.1220
Total Pigments	0.5600		0.1510	